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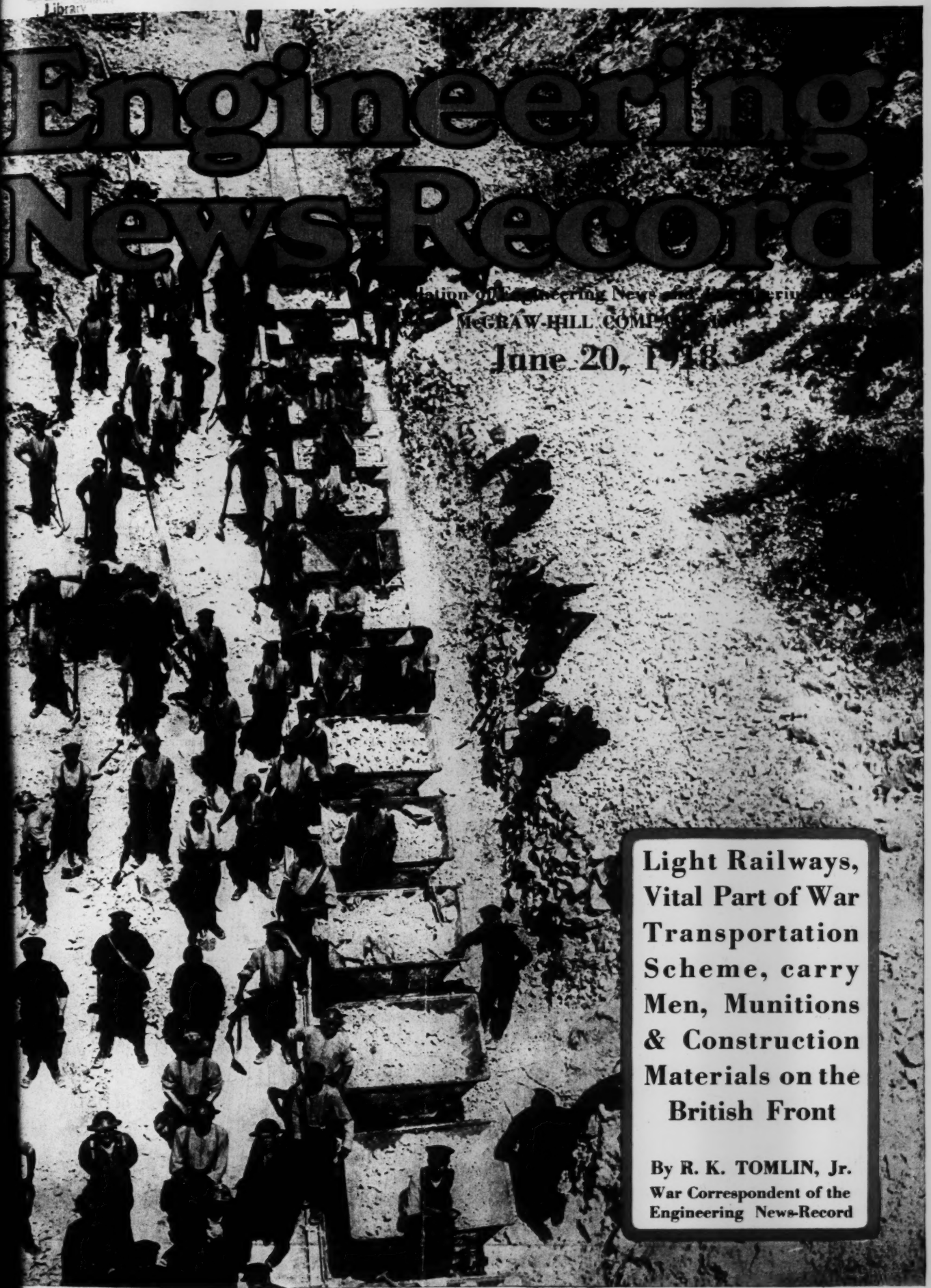

Light Railways, Vital Part of War Transportation Scheme, carry Men, Munitions & Construction Materials on the British Front

By R. K. TOMLIN, Jr.
War Correspondent of the Engineering News-Record

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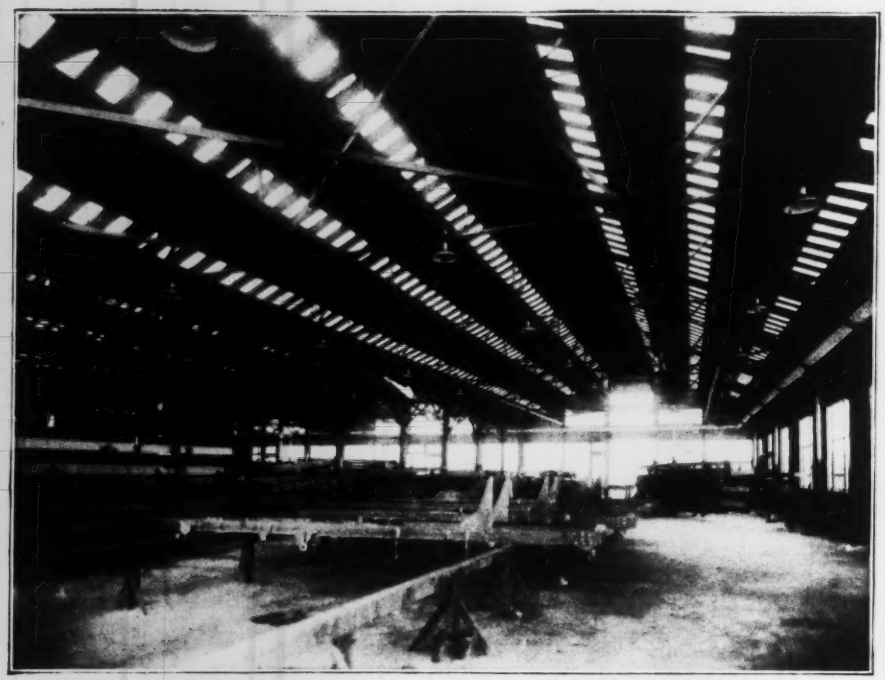

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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
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AND CONTRACTING

E. J. MEHREN, *Editor* — CHARLES WHITING BAKER, *Consulting Editor*

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Force Engineering Students to Stay in College

ONLY those who are hidebound by outworn military traditions will lack sympathy with the views expressed by Dean Richards of the college of engineering of the University of Illinois in his letter to Secretary Baker, printed in the news section of this issue. In a war of engineering we are deliberately cutting off our supply of young engineers. By indirection we are even forcing into the service those of "upper-third" standing, not even obliging them to complete their work. They *may* stay in college under the regulations, but they will not stay, for fear of being branded "slackers." Only by ordering them to remain can we, in a long drawn out war, insure the essential supply of technical brains. Engineering teachers and engineers generally should write to Washington urging upon the Government the suggestion Dean Richards makes. It is the highest patriotism. The engineering societies can do a big work here—in fact, they have a clear duty to perform. The selective draft has worked well in providing for the release of family breadwinners. Slowly the same clear thinking is being applied to industrial needs. We can and should accelerate the process.

Federal Government Should Set Example

SERIOUS water shortage is threatened at Washington. To lessen the danger Congress should not fail to carry out two recommendations made last November by the Secretary of War. These were apparently overlooked in framing the District appropriation bill for 1918-19, so Secretary Baker has just renewed them. One called for the very modest appropriation of $32,000 to complete the metering of services through which water is supplied for Federal purposes in Washington. The other recommendation, if followed, would result in saving nearly 3,000,000 gal. a day of filtered water now used for condensing purposes at the Government Printing Office. All this water could be saved by supplying the printing plant with electric power from the Capitol power plant not far distant, as was proposed by Secretary Baker last November. Why the District Appropriation committee should have overlooked these two recommendations it is difficult to see. Each, a measure of economy and of safety in ordinary times, is many fold more necessary in war times. When officers of the Federal Government are not sparing time, energy or money to urge upon the people of the country every possible measure of thrift and economy, it seems utterly inexcusable to continue to practise wholesale wastefulness in Washington, where there is no lack of power to see that measures of economy are both authorized and enforced. The Federal Government should set the example. The District of Columbia should be a model of good municipal government for the whole country.

Issuing Bonds for Annual Flood Damages

MEETING annual flood damages by bond issues is a bad habit for a city to acquire. A western city met flood damages a year ago by issuing warrants. This year no money was available to take up the warrants, so the city council voted bonds for the purpose. Meanwhile, the same "creek" has been in flood and the city council proposes to issue still more bonds "as soon as the actual cost of this year's rampage is determined." The flood warrants converted into bonds amounted to $6000 and it is estimated that this year's flood damages will be about the same. The sum of $6000 every year would pay interest charges on $100,000, which might provide adequate flood-protection works.

Free Garbage Service and Share in Profits

REDUCING the expense of garbage collection and disposal is all that most cities whose officials know how to figure costs have hoped for, until recently. Few, indeed, have had such hopes realized. At best, the price received for the garbage after collection, or the profit realized from municipally owned disposal works, has helped pay the cost of collection. A different story comes from Wichita. A contractor has recently agreed to collect the garbage of that city free of charge and to feed it to hogs. He has also agreed to pay the city 10% of whatever profit the hogs yield him. The contract is so commendable in many respects that it is printed on p. 1180. It might be better elsewhere—possibly it would have been better in Wichita—to have the superintendent who is to keep check on the contractor paid by the city instead of the contractor, and to have a provision for the taking over by the city of the plant of the contractor at the expiration of the contract in case the contract is not renewed.

Work to Be Done in Freeing Toll Bridges

NEWS that means progress tells of a highway bridge across the Delaware River becoming state property, free to public travel. There is a flavor of old times in the news—it brings a reminder of the turnpike period, when toll gates barred nearly every avenue of traffic.

Those days are long past; a broader sense of public obligation prevails today. But in spite of this progress away from the toll road, until this month there existed not a single free highway between New Jersey and Pennsylvania. Every bridge was a toll station, sixteen in all. It is evident that much work remains to be done before our road system is entirely delivered from its old bonds. But though distant, the time is in prospect when every strategic connecting link will be as free of hindrance as the highways themselves.

Ethics for Engineers in Peace and in War

"A PROFESSION has for its prime object the service it can render to humanity. Reward or financial gain should be a subordinate consideration."

These sentences are quoted directly from the code of ethics adopted by the American Medical Association, as stated in a paper read by Morris L. Cooke last week at the Worcester meeting of the American Society of Mechanical Engineers.

The title of Mr. Cooke's paper was "The Public Interest as the Bed Rock of Professional Practice." He pointed out that the codes of professional ethics which have been adopted by various engineering societies have hitherto ignored the obligation which engineers, as members of a profession, owe to the public, while this obligation is definitely recognized in the formal codes of the architects, and the lawyers, as well as the physicians.

In the present emergency, engineers as a class are making every possible effort to serve the common cause at a sacrifice of personal convenience, financial interest and life itself. At this time, therefore, argued Mr. Cooke, when engineers are displaying patriotism and devotion to high ideals of public service as never before, it would be appropriate to redraft their written codes of ethics so as definitely to recognize the obligation which the engineer owes to the public.

There was no dissent, in the discussion at Worcester, from Mr. Cooke's proposals. It is undeniably true that engineers as a class are now displaying a patriotic zeal and sacrifice in the country's service equal at least to that displayed by members of any other profession. And this was also true before the war emergency. Few will doubt that the devotion to the public interest of the average engineer has been at least equal to that of the average lawyer, notwithstanding any differences in the written codes of ethics of the two professions.

None will question the desirability of redrafting our codes of professional conduct to conform to the high ideals of public service with which the war necessities have inspired men. More urgent at the present time, however, is it that these high ideals shall be universally recognized and observed. In accordance with the principles laid down by Mr. Cooke, the profession looks to all its members engaged in war work, whether in uniform or in the industrial army, to place the nation's interest foremost under all conditions.

To put this in a very practical way, this means that any man who places personal or commercial interest ahead of the national welfare in any department of war work is falling short of his duty. There should be no grabbing for war contracts. No man and no concern has a right to undertake work which another can do better or more rapidly. The nation wants guns, airplanes, ships, clothing and a thousand other necessities in the shortest possible time. The only question in distributing this work should be the ability of a concern to deliver the goods. Whoever permits any other considerations to control at this time is aiding the enemy.

An Official Definition of "Profiteering"

CURRENT condemnation of "profiteering" and "profiteers" is likely to lead to some injustice, and, what is worse, to interfering with the output of war necessities, unless the public clearly understands the significance of this newly coined word. There is a current idea abroad that "profiteering" refers to the making of any profit whatever on war contracts.

Few stop to reflect that profit is an absolute essential to the conduct of business, and that in order to stimulate the enormous volume of production necessary to win the war the business of production must be kept on a profit-making basis. It is urged by the theorists that business should be continued from patriotic motives solely, that all work for the Government should be done at actual cost; but as a practical matter, it is impossible to carry on business in that way. Nobody is wise enough to say in advance exactly what it will cost to raise a bushel of wheat, or to build a ship, or to erect an army cantonment at this time when prices of labor and materials and the supply of both are such uncertain quantities. If the price is fixed in advance, it must contain a very considerable margin of safety to cover the risk. The farmer, or the manufacturer, or the merchant who should attempt from patriotic motives to carry on business in these times without making a profit would find it impossible to obtain capital for his work; and if he used capital already secured, regardless of his obligation to its owners, he would soon be bankrupt and unable to further work to help win the war.

"Profiteering" does not mean making profits out of the war. It means making a profit which is excessive and unreasonable. It is gratifying to have an official statement to this effect from Secretary McAdoo, the financial head of the Government. In his letter of June 6, to Representative Kitchin, on the lines to be followed in framing a new revenue bill, Mr. McAdoo said:

"The Government departments, under great pressure, as they are, to get necessary war materials and supplies with the utmost expedition, cannot in the nature of things fix their prices nor guard their contracts in such a way as to avoid the possibility of profiteering. The one sure way is to tax away the excessive profits when they have been realized.

"I do not say this in a spirit of criticism of the corporations or business men of the country, who have for the most part loyally supported the Government. In entering into war contracts they take grave risks. They are called upon to make vast expenditures of capital for purposes which may prove unproductive after the war. They are not to be blamed in these circumstances for asking for prices and terms which cover these risks. On the other hand, when the risk has been liquidated by proper allowances and the contract has proved profitable, the Government should take back in taxes all profits above a reasonable reward.

"Of course, no one objects to reasonable profits; on the contrary, every one should want, and I am sure does want, business and enterprise to be rewarded with reasonable, or even liberal, profits."

Doubtless there are those who will argue that instead of allowing profits on war contracts, the Government itself should commandeer all the manufacturing plants, and carry them on by its own organization. Only theorists, however, unfamiliar with the business of production, could possibly entertain such a view. Every engineer familiar with conditions at Washington, and elsewhere throughout the country, knows the great difficulties that are being experienced in securing efficient and rapid operation in the enomous tasks with the Government has already undertaken. Entirely commendable as it is to spend the Government funds economically, the things that are far more essential at the present time are volume of production and speed of production. Anything that interferes with these, such as the transfer of well conducted private business to Government operation, would "give aid and comfort to the enemy."

To Reclaim Land for Returning Soldiers

IN LINE with the emphasis being laid in these columns on the need of preparing now to meet after-the-war problems, is a letter to the President written by Secretary Lane in furtherance of the plan he proposed at the April meeting of the United States Chamber of Commerce, urging that studies of land reclamation problems be begun at once.

At the close of the Civil War the Government was able to give vast numbers of disbanded soldiers an opportunity to settle on the fertile public lands of the Mississippi Valley. It is not possible to duplicate that opportunity today. It is possible, however, through Government action, to irrigate arid lands, drain vast swamps, clear cut-over timber lands in various parts of the country, and provide the opportunity for great numbers of the returning soldiers to make new homes.

Already, says Secretary Lane, the Reclamation Service has nearly completed a study of the possibilities of land reclamation in the upper and lower Colorado basins, by which it is believed more than 3,000,000 acres of territory can be opened. And this is only a beginning.

Secretary Lane frankly recognizes that land reclamation is only a part of the necessary work. A new land policy must be conceived and worked out to meet the new conditions that confront us. He quotes with high approval Dr. Elwood Mead's plea that the necessities of the settler should be studied and provided for as a part of the land reclamation work. With these objects in view, he urges on the President and Congress the provision at this time of a fund of $2,000,000 for developing a constructive plan to provide in advance for the emergency which will exist when millions of men come home to seek employment and opportunity.

Engineers who have given most time and effort to the study of land reclamation problems can best appreciate the vast importance of Secretary Lane's statesmanlike proposal. He is right in saying in the concluding sentence of his letter, "This work should not be postponed." Money cannot be spent to better advantage than in carrying forward this work of investigation. To make careful and wise plans now will not only save millions of dollars in the future—it will save for the nation things more valuable than dollars.

Concentrate Engineering Talent and Experimental Facilities on the War

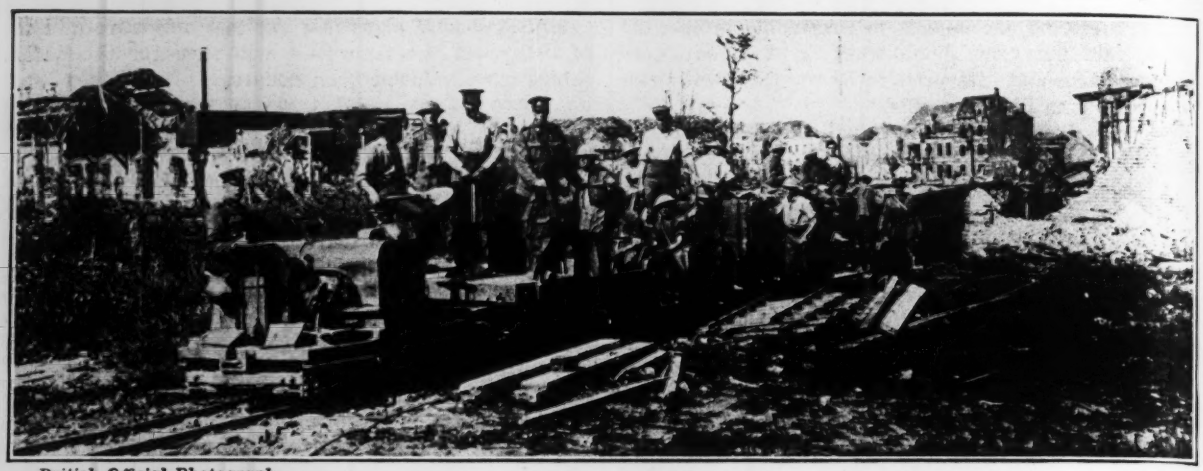
SELDOM does a week go by without our hearing of some new device or improvement in military machines made by the Germans. Now it is a new gas, again a bigger submarine, then an armored airplane or the long-range gun. Always the improvement or novelty represents an engineering development—*the fruit of the concentration by Germany of all her technical brains on war problems.* One does not need to be told that in this country we are far from using on war work all of our engineering brains or of our laboratory and experimental equipment. Everywhere men skilled in developing mechanisms remain unusued; everywhere plants and institutions with facilities for doing good experimental work are allowed to remain idle.

True, we are doing some research work, and there have been excellent results. But we have barely made a beginning. There are important divisions of the war machine doing no development work whatever. Moreover, machinery for expanding development work does not exist. The National Research Council is a coördinating and advisory body. For greatest effectiveness there must be large development sections in the executive departments themselves. They have the funds, and the development agencies can be used to best advantage when in closest contact with the departments they serve. The research council will still be needed as a coördinator; its data on available laboratory facilities and the status of research in the various branches of warfare will be of invaluable assistance.

While, as suggested, there must be close contact between the various departments and their research agencies, it should be clearly borne in mind that there must be a sharp line of demarkation between development work and production. Confusion of development with production has been a blighting curse on much of our army work since April, 1917. The airplane *débacle* was due primarily to such interference. Those who did not understand production were constantly changing designs in an effort to get the very best. Meanwhile, planes were sorely needed in France, and less perfect machines would have been of incalculable value.

Naturally, the formulation of the right plan requires a recognition of the work of present agencies—the Bureau of Standards, the National Research Council, the development groups in various divisions of the war machine. Best results would seem to be promised were a man of the Schwab or Ryan mold, understanding the function of development and research work as carried on in the great private industries, placed in charge of all development. He would build large, his vision would inspire engineers and scientists to the utmost effort, his energy would bring to bear on war problems, even as Germany has done, all our available engineering talent, all the existing facilities for scientific research.

Could we meet Germany on such a basis our past achievements would warrant us in abiding the result with confidence.



British Official Photograph

The Light Railway Along the British Front at Close Range

Where and How the Lines Are Built, How They Are Maintained and Operated, and What They Accomplish—Highways Relieved of Their Overload

By Robert K. Tomlin, Jr.
War Correspondent of Engineering News-Record

Last week Mr. Tomlin related how he obtained the story of the light railways along the front. He also set forth how these railways have revolutionized the salvage of material. This week he tells how the railways are built, maintained and operated.—Editor.

THE primary function of the light railway, as explained in a former article (*Engineering News-Record* of Mar. 14, 1918, p. 508) is to deliver ammunition, troops, rations and supplies from standard-gage railheads to points near the front, and by so doing relieve the highways of the enormous burden of traffic which they used to carry. The accompanying sketch plan (Fig. 1), which is purely theoretical and does not convey information as to any actual location on the ground, will show the general relation to one another of the parts of a light railway system for the battlefront, and the area in the rear.

In the extreme forward section, it will be noted, ropeways or push trolleys may be provided, although many situations demand the packing of ammunition and supplies on the backs of animals or men. Where possible, spurs are run out to artillery batteries, to which ammunition is delivered, one carload at a time. Further to the rear will be noted the various "dumps" for ammunition and stores. The designation "R. E." on the sketch means "Royal Engineers," and when used in connection with supplies refers to such material as timber, sand bags, wire mesh trench revetment, barbed wire, corrugated-iron covering for dugouts and huts, duckboards, etc. At the extreme left the letters "C. C. S." signify "Casualty Clearing Station," to which the wounded are brought back, on light railway cars.

The layout at the railhead (Fig. 3) provides for the transshipment of material from the standard-gage railroad to the light railway, for the assembly of cars into trains, and for the storage of ammunition, ordnance and supplies. Fig. 2 shows a light railway delivering a load of rations to wagon trains.

The diagram shows also the loop system and cross connections which are characteristic of British light-railway practice. The idea is to have the loaded cars move forward on only one side of the loop, and the empties return on the other. Even where turnouts are built, the British endeavor to prevent even short-haul train movements in opposite directions on the same side of a loop, and during my trip over the lines a non-commissioned officer in charge of a gang building dugouts was called to account for running a light push car forward on the track over which our train was making the inbound journey.

Although I saw some short sections of double track, the general practice here is to construct single track only, thus offering a smaller target for shell fire and cutting down the time needed for repair work if the track should be hit.

The mileage of light railway track per mile of battlefront varies within wide limits. In a quiet sector it may be as little as five miles, while in territory where there is much activity there may be a mileage of 10, 12 or even more per mile of front. A single-track light railway weighs about 72 tons a mile for rail, connections and ties, while, as a rough average, 800 tons of ballast per mile is necessary, unless the ground is unusually bad. I was told that the grading, laying and ballasting of one mile of finished track requires, normally, about 2400 man-days of labor. On some speedier work 1760 man-days of labor per mile of track were recorded, while during the Cambrai "show"—every big engagement is called a "show" over here—a Canadian lieutenant colonel and his men laid six miles of track in 60 hours.

Repair work for all British armies at the time of my visit was involving the replacement each week of from 1500 to 2000 ft. of track broken by shell fire. This is an almost insignificant percentage of the total. In one army, however, 95 breaks in one day, due to shelling, were recorded, but this army has a greater track mileage than any other.

At the head of the organization which is assigned to light railways is the Director of Light Railways (D. L. R.) who reports to the Director General of Transportation (D. G. T.). A mere listing of the various rungs in the organization ladder, however, would fail to convey an adequate idea of its real character. It is only when you circulate through the headquarters offices, go out on the line among the men, and see the splendid work they are doing, that you obtain a true appreciation of the light-railway forces. Both British and American officers are all railway specialists, hailing from every corner of the world—men who have built and operated railroads in Great Britain, the United States, Brazil, Canada, the Argentine, India, Mexico and elsewhere. The American force on one section of the line, for example, had been recruited, whole companies at a time, from such American roads as the Boston & Albany, Maine Central, New York, New Haven & Hartford, and Boston & Maine. The commissioned officers in these various companies, as a rule, came from the same railroads as the enlisted men.

Having spent most of my time among officers and observed the splendid *esprit de corps* which prevails over the whole front, I was interested in getting the enlisted man's point of view, and during a stop at a siding I went up forward for a chat with the engine driver and the brakeman of our train. One, I found, had served on the B. & A., and the other on the New York, New Haven & Hartford.

"Quite a difference between this job and the one back home on the B & A.," I said to the driver. "What gives you the most trouble in running one of these tractors?"

He didn't hesitate a minute. "She's off the iron a little more than I like."

Here was a man, who, by night or by day, nosed his trainloads of ammunition or supplies up into the danger zone where high-explosive shells, gas attacks and bombs from airplanes were all part of the day's work, and his chief concern was not of these things, but of engine derailments, of being "off the iron," of delays which would slow up deliveries. In answering my question, he had, unconsciously, given me something for which I had been blindly groping—a crystallization in words of the spirit which animates the light-railway organization.

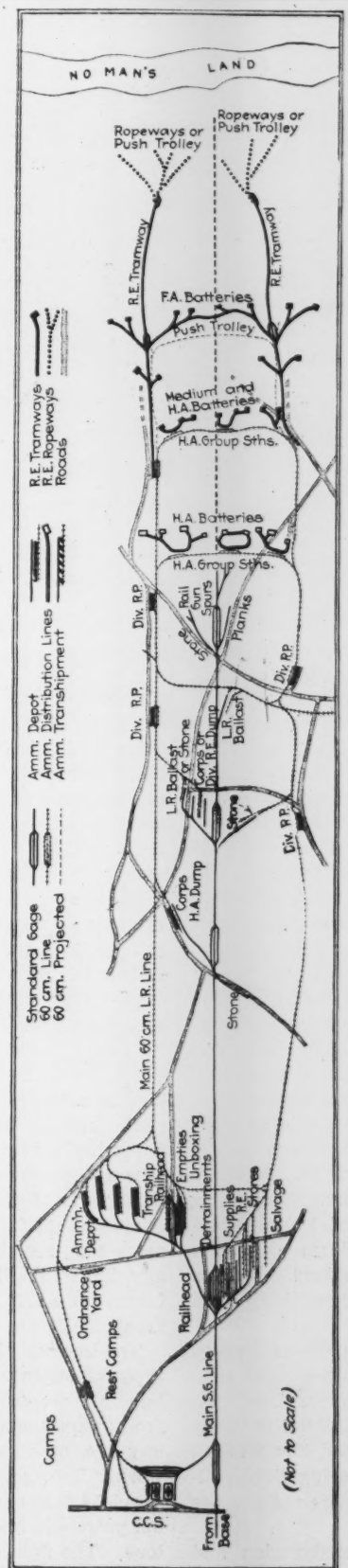


FIG. 1. SKETCH PLAN INDICATES RELATION OF VARIOUS PARTS OF A LIGHT-RAILWAY SYSTEM

In the location of light railways no hard and fast rules other than those given in the article in this journal, previously referred to, can be laid down. The basic principle is that the line must follow the contour of the ground as closely as possible, although sometimes a trestle is built (Fig. 4). Heavy cuts or fills must be avoided. It follows, therefore, that a light railway line, particularly near the front, contains a good many curves; the sharpest are of 30-m. radius. An effort is made to keep the ruling grade below 2½%, but in some places 4% grades are required by local conditions.

As to proximity to the front, practice varies considerably also. In very quiet sectors, however, the lines may run as far forward as the reserve trenches. In others, single track known as "trench tramways" are used. Location depends upon the ground and the conditions with regard to observation by the enemy.

Fig. 5 gives a good idea of how a light railway line is constructed. Rail connections are made by fishplates and bolts, four bolts per joint. A radical change in practice has gone into effect recently involving the substitution of wood for steel ties. I traveled over a great many miles of line in the Flanders area, and close contact with the all-prevailing mud of that region indicated quickly the reason for providing as large a bearing area as possible for the track. The wood ties are about 4½ ft. long, 7 in. wide and 4½ in. thick. When steel ties were used the track sections, built up complete with ties, were delivered and laid in lengths of 5 m. The change to wooden ties, however, makes it necessary to spike down the rails in the field. I passed over long sections of old construction where wooden ties had been inserted under the rails between pairs of the steel ties.

Much of the ground in the north-

British Official Photograph

FIG. 2. THE PRIMARY FUNCTION OF LIGHT RAILWAYS IS TO DELIVER RATIONS, AMMUNITION AND SUPPLIES TO POINTS FROM WHICH THEY CAN BE QUICKLY DELIVERED TO THE TROOPS

ern areas occupied by the British armies is a regular morass, so that the drainage of the light-railway roadbed is an extremely important part of the construction. Ditches on one or both sides of the line are universal. In looking over the weekly reports in an American captain's quarters, I found a record of a 17-ton locomotive which had toppled over on its side when standing still, due to settlement of the saturated ground on which the track was laid.

The construction and maintenance problems are further complicated by the scarcity of good ballast. The most easily obtainable material is the chalk which is characteristic of this region, and large quantities of it are employed for track ballast if nothing better can be had (Fig. 6). The chalk, fairly satisfactory in dry weather, "turns to cream when it rains"—to use the phrase of one of the officers who was discussing its properties with me. Another objection to chalk ballast is that it shows up prominently in aërial photographs and offers a good target for artillery fire or bombing.

Back of one of the American railway camps is a pit from which sand is being taken for track ballast, and it is proving very satisfactory. In this area the old chalk ballast is either being removed and replaced by sand, or else covered with sand. Another material for ballast is what is called "mine earth," but this is to be had only in places near the coal-mining regions. It is a waste product, looks like slate, and serves fairly well as ballast.

Traveling over certain sections in northern France and Belgium, I looked down between the rails and read there the tragedy of cities that are no more, for brick and stone—all that remains of the buildings in what used to be towns near the front—are used to a limited extent near destroyed villages for ballasting light-railway tracks. A Government permit is required for the removal of this débris.

In spite of all the difficulties of construction and scarcity of materials, the track, in all of the regions where I traveled, is in very good condition. Derailments occur, of course, but with the comparatively light rolling stock used it is not much of a job to get an engine or tractor back on the rails. Rounding a curve at Ypres, where the track makes sharp turns to dodge the ruins of buildings, our petrol tractor—a 20-hp. machine—was derailed. With a few wood blocks and steel bars, carried by every train, we got it quickly on the rails. Another time, when our tractor became unruly and jumped the track, it was lifted bodily and replaced by a working crew which happened to be near—just a case of "Off agin, on agin, gone agin—Finnegan."

Maintenance is consolidated with construction in the extreme forward areas, while farther to the rear separate gangs are assigned to these two duties. The chief task is the relining and reballasting of track—for some of the very muddy areas are great "ballast eaters"—and the repair of breaks due to shelling. The maintenance crew must also keep the drainage ditches and culverts clear. During periods of frost and thaw a great deal of resurfacing is called for, and at such times the chalk ballast is particularly troublesome. Repair of track broken by shell fire falls to the lot of the maintenance or construction gang, according to whether the damage is at the front or rear. I was told at headquarters that for all the British armies the maintenance work requires about 14 men per mile of track. Breakage due to shelling at the time of my visit varied between 1500 and 2000 ft. of track a week for the entire front.

The hauling of light-railway trains is done by several types of engine. In the rear area three makes of coal-burning steam locomotives predominate. Near the front, where smoke and steam would draw enemy artillery fire, petrol-electric and plain petrol tractors do the work. Two of the types of steam locomotive weigh about 14 tons each and the third 17 tons. The 40 to 45-hp. petrol-electric, or "P. E.," as it is called, weighs six tons. The light petrol tractor, 20-hp., weighs somewhat less than two tons. There is, in addition, a tractor weighing about one ton, which consists of a small auto

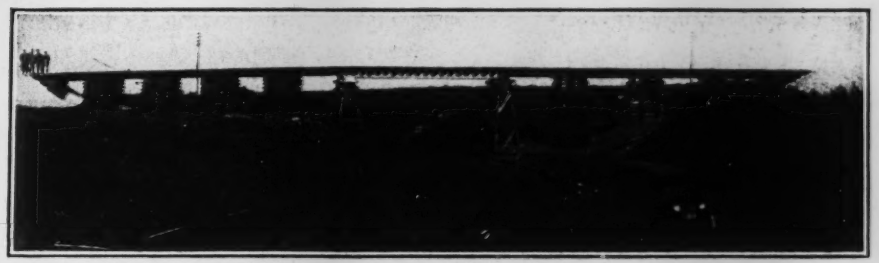
engine on a special truck; it is used for inspection trips or for hauling single carloads near the front. The table printed elsewhere in this article gives the load test on different grades for the several types of machine.

The steam locomotives, on account of their visibility, as before noted, and also the desirability of running them on track which is fairly well aligned, are reserved

I asked one engine driver about the relative operating difficulties with the light and heavy rolling stock. He replied, in substance, that the "P. E.'s" and steam engines, if derailed, dug down into the roadbed, and, on account of their weight, came to a quick stop. The lighter machines, while easier to handle in case of accidents, generally ran farther off the rails.

British Official Photographs

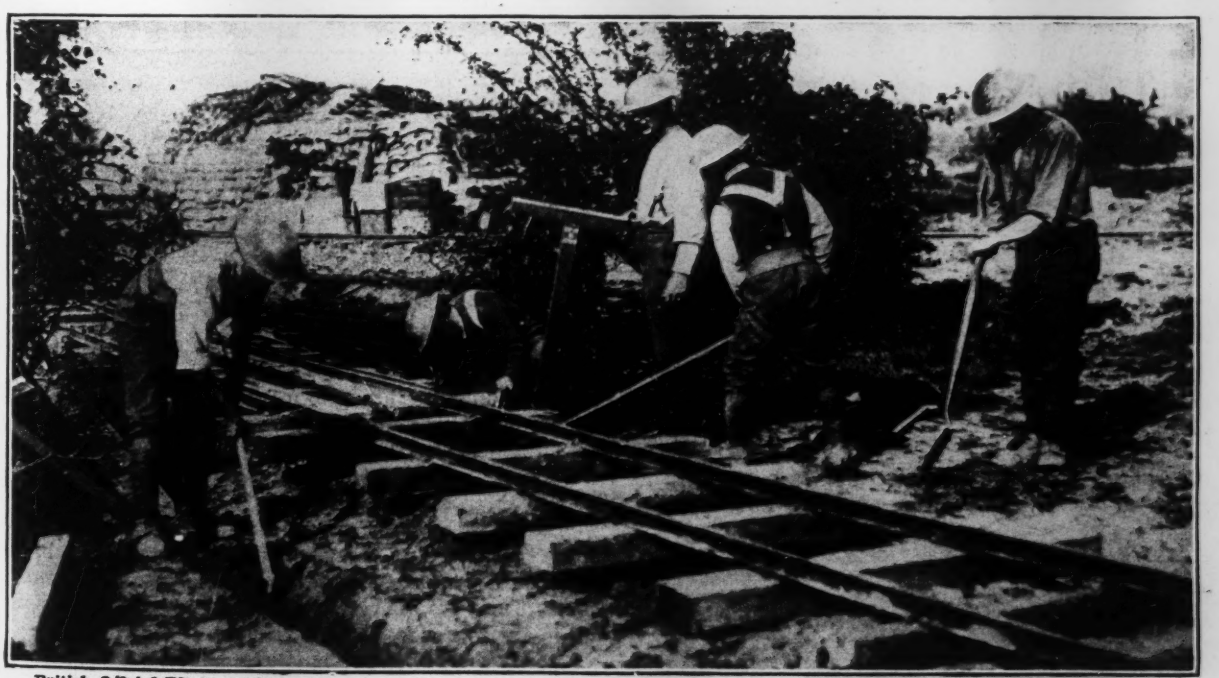
FIGS. 3 AND 4. THE LAYOUT AT THE STANDARD-GAGE RAILHEAD PROVIDES FOR TRANSSHIPMENT TO THE LIGHT RAILWAY CARS—OCCASIONALLY IT IS NECESSARY TO BUILD A TRESTLE



principally for the rear-area haulage, while the petrol-electrics, and particularly the lighter petrol tractors, are for use close to the front lines. The petrol-electrics are equipped with internal combustion engines and generators, the motors being mounted directly on the axles. As indicated in the table, they are for heavier work than the plain petrol machines.

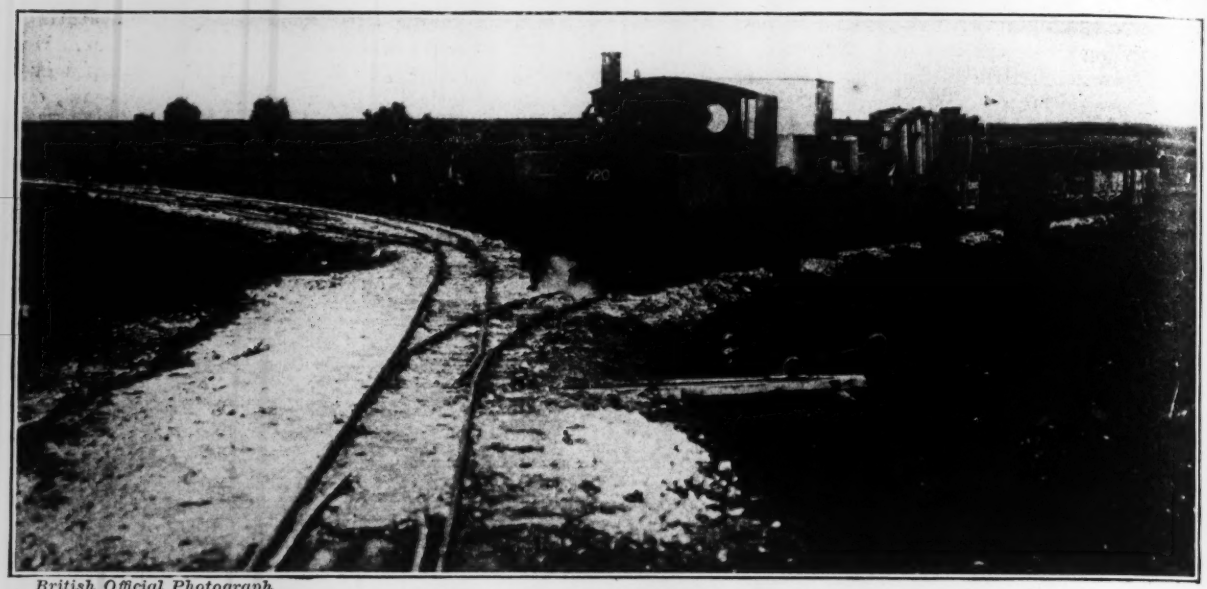
On the petrol-tractor trains the crew consists of two men, driver and brakeman. With steam haulage, a third man, the fireman, is required. The maximum speed allowed is about eight miles per hour, with a limit of three miles per hour at grade crossings.

A great many types of cars are used in light-railway operation, depending on the kind of material to be



British Official Photograph

FIG. 5. IN CONSTRUCTING LIGHT RAILWAYS IT IS ALMOST UNIVERSAL PRACTICE NOW TO USE WOODEN TIES INSTEAD OF THE STEEL TIES FORMERLY MADE UP AS PART OF EACH TRACK SECTION



British Official Photograph

FIG. 6. A SECTION OF TRACK BALLASTED WITH THE CHALK FOUND IN THE VICINITY

Note also the swtches, the drainage ditch at the right, which is a very important feature in muddy ground, the type of steam locomotive with water tanks on either side of boiler, the cars and the character of material carried in them

British Official Photopraphs

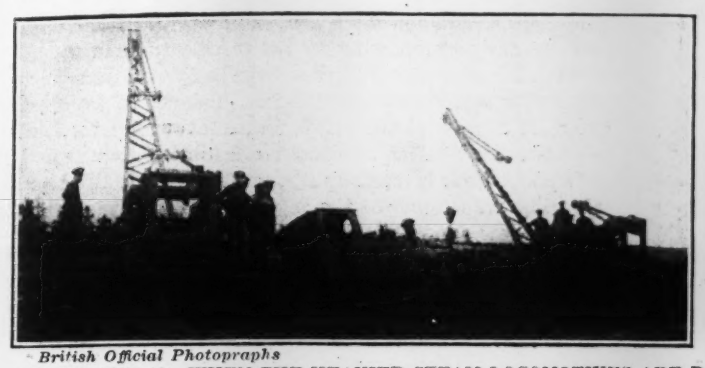
FIGS. 7 AND 8. GONDOLA CARS OF THE FLAT-BOTTOM AND WELL-BOTTOM TYPES ARE USED IN LARGE NUMBERS—THE WOUNDED ARE TRANSPORTED IN SPECIAL CARS BY LIGHT RAILWAY

hauled. The bulk of the freight handled comes under the following classifications: Ammunition, timber, coal and coke, rations, ballast, R. E. stores, salvage, stone for highway maintenance, with troops going to or returning from the front. In one army which I visited about a dozen different kinds of car were in service. The prevailing car (Fig. 7) is a gondola about 20 ft. long and 5 ft. wide, made in both the flat and the wall types. These cars can carry about 10 tons of ammunition, but with lighter and more bulky material, such as R. E. stores, the load per car may be only five or six tons. With troops the load per car will average about three tons. For perishable rations covered box cars are available. Then, too, there are small four-wheeled wagons, 8 ft. in length, for loads of 3½ tons each. For the hauling of heavy ordnance special trucks have been developed.

Hospital cars (Fig. 8), fitted up with banks of berths for carrying the wounded, are included in the rolling

LOAD TEST, IN LONG TONS, FOR LIGHT RAILWAY ENGINES AND TRACTORS ON BRITISH FRONT IN FRANCE

Equivalent Grade, Per Cent.	Steam Locomotives	Petrol-Electric, 40-Hp.	Petrol Tractor, 20-Hp.
0.5	164	82	33
0.5–1.0	105	53	21
1.0–1.5	78	39	16
1.5–2.0	62	31	12
2.0–2.5	50	25	10
2.5–3.0	44	22	9



British Official Photopraphs

FIGS. 9 AND 10. WHEN THE HEAVIER STEAM LOCOMOTIVES ARE DERAILED, WRECKING CARS LIFT THEM BACK
The lighter petrol tractors can often be handled by blocking, steel bars or rerailing irons

stock. I was told by the Assistant Director of Light Railways in one army zone that under normal operating conditions he considered 75 tons per 10-ton car per week a fair working average.

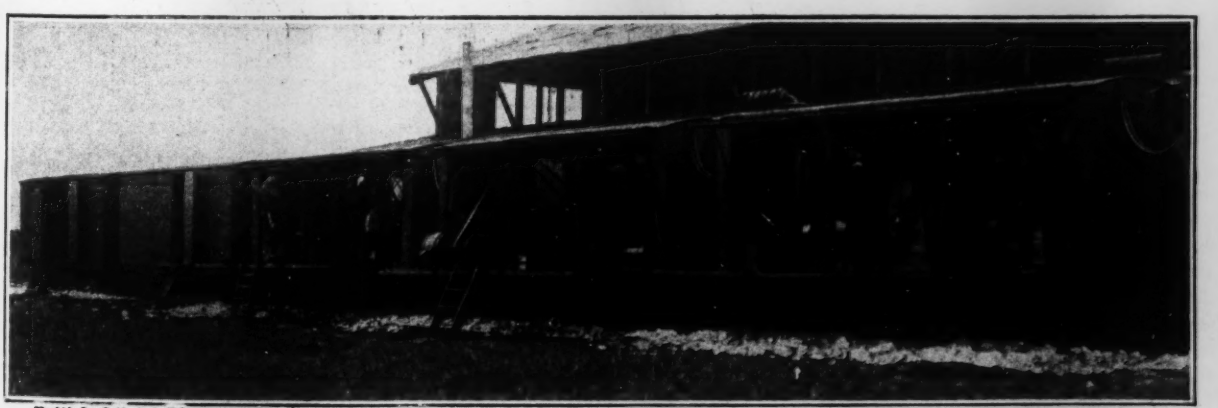
In addition to the car types enumerated, there are wrecking cars and cranes (Figs. 9 and 10), for lifting derailed engines and tractors, and special groups of four or more cars, each 20 ft. long and 5 ft. 4 in. wide, constituting machine shops on wheels (Fig. 11). The equipment in the latter includes drills, grinders, hacksaws, lathes and planers. These tools are operated by power from one of the standard petrol-electric tractors, which, if the occasion should demand, can haul the machine shop forward or backward. The shop on wheels remains in one location, however, unless it is decided to change the light-railway base. The sides of these machine-shop cars are hinged at the bottom and open outward, forming a platform extension on each side.

Where the repair work is too heavy or complicated to be handled readily in the field, the rolling stock is shipped to a large central repair plant, thoroughly equipped with machine tools, spare parts and appliances of every sort for rehabilitating engines or cars suffering from "shell shock" or other ailments incident to light-railway operation. We had intended to make a detour in our route for a visit to this central plant, but our schedule was so full that time did not permit an inspection of this very important feature of light-railway work.

The information concerning light railways which I had picked up in scraps of conversation here and there before my visit to the front had led me to believe that these systems were operated to some extent on the go-as-you-please plan. An inspection of the field control posts and central train-despatching offices in every army on the British front quickly dispelled this impression. Traffic is closely regulated, and the system in force allows the A. D. L. R. or his assistants to know at every hour of the day where each engine, tractor or car is, whether it is loaded or empty, what kind of freight is being hauled, and scores of similar details. In fact, one of our American railway operating detachments has gone to the length of preparing a timetable for its section. The operating scheme in all of its main features is standardized along the whole front. From the nature of things operation in the forward zone is largely at night.

In every army zone there are a central control station near A. D. L. R. headquarters and district control posts at various points on the line, in direct telephonic communication with the main station. The time of departure of a train from the yards is telephoned to the district posts, with the approximate time of arrival at the latter, and no train is allowed to pass a district post unless the attendant has been so authorized.

On one wall of every central control post is a long board with slotted wooden strips corresponding to every section of main track and siding in the system. Code numbers are given to each "station" on the line, and



British Official Photograph

FIG. 11. ORDINARY FIELD REPAIRS TO ROLLING STOCK ARE MADE IN A MACHINE SHOP ON WHEELS
For heavy repair work and general overhauling equipment is sent to a central repair plant

LRF/C. 100. Loco Tractor No. Class:—

Depot:— Date:— 19

Driver:— On Duty:—

Fireman:— On Duty:—

Guard:— On Duty:—

Train No.	Station	Arr.	Dep.	Attached. No.	Attached. Contents.	Detached. No.	Detached. Contents.
57	C-1		800	5032	Ammo		
				154	"		
				897	"		
	C-3	830	835			5032	Ammo
	C-5	850	855			154	Ammo
	C-9	915	10.15	2.35	Water		
	C-103	1025				897	Ammo
						235	Water

FIG. 12

LRF/C 101. Wagon No. 61 Class K. Date 2-10 Train No. 120

From	Time Arrived	Time Departed
C 6 Line		643
C 201		
C 202	7.53	

Contents:— C. C. Weight:—

FIG. 13

LRF. A. 14. **LIGHT RAILWAYS.**

TO

LOADED AT

MATERIAL

CONSIGNOR

CONSIGNEE

DATE

Tons	Cwts.

FIG. 14

FIGS. 12, 13 AND 14. THESE FORMS TRACE EACH TRAIN AND EACH OF ITS CARS

these are lettered on the board. Clips, with hooks which fit into grooves representing the track, are hung up for each train and moved forward or backward in accordance with reports on movements. A glance at the chart with its clips—red for "loaded" and green for "empty"—shows the position of every train in operation.

When a train is made up a form (Fig. 12) is filled out, showing the number of the engine or tractor, the names of the crew, the destination, etc. For each car a "chit" (Fig. 13) and waybill (Fig. 14) are prepared. Then all the forms for one train are attached to the clip on the main board and are moved back and forth with it. This gives a complete and immediate record. In light railway operation time is recorded according to a 24-hour system, starting at midnight. Thus a train does not leave at "9 p.m.," but at "21 hr."

At each "station" on the main board is a small tin box with two divisions labelled "loaded" and "empty." When a car is dropped from a train at any "station" or siding this fact is reported by telephone to the central control station. The "chit" for the car is then removed from its clip and deposited in the "loaded" compartment of the proper tin box and transferred to the "empty" compartment at the right time. Thus, information as to the location of the empties, for subsequent collection, is always at hand. When an engine has finished its run the chits are removed from the tin boxes on the control board and given to clerks who keep complete statistical records of the tonnage hauled.

In addition to this main train-despatching board there are separate boards at the central control stations designed to show the status, by districts, of each tractor and of each car—the number loaded and empty and the number working or idle. For each tractor or car there is a perforated metal disk, numbered, and, in the case of the cars, painted in two colors, red signifying loaded, and green empty. The locomotive and tractor disks are hung on hooks under three classifications: "Working," "spare"

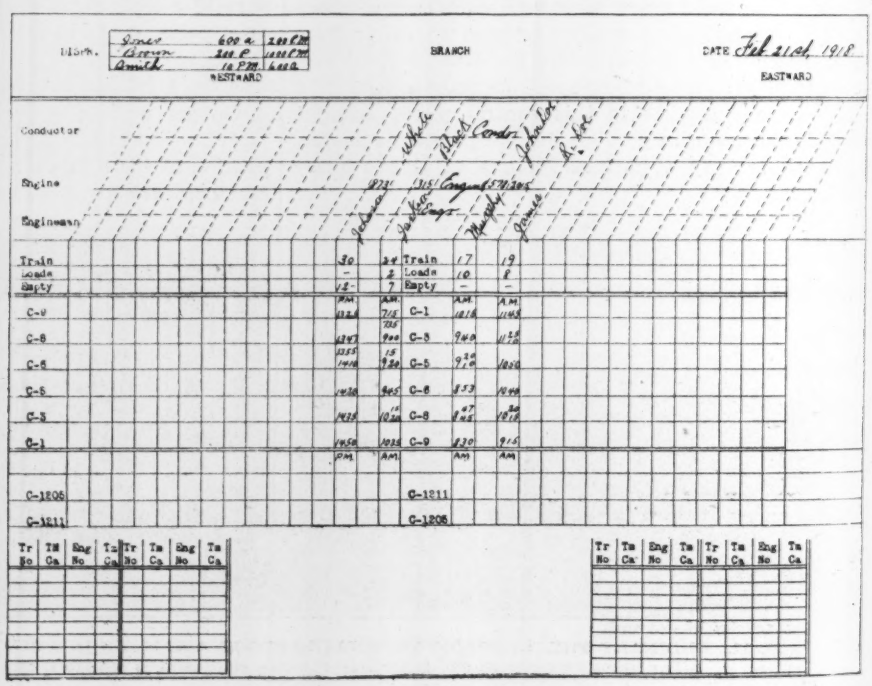


FIG. 15. THIS FORM OF TRAIN SHEET IS KEPT BY THE AMERICAN RAILWAY DETACHMENTS

and "under repairs," assigned properly to their districts. A similar scheme of metal checks and hooks is employed for the cars, the classifications being "on hand," "loaded," "empty," "in transit" and "demurrage." The American railway detachments employ the system in vogue in the British central and district control posts, and in addition keep a train sheet (Fig. 15). While the latter is not officially recognized, it is the method which members of the operating force had employed on their own railroads in the States, and is kept up to date as a piece of extra work.

A very necessary part of the control system is the telephone lines, and to each A. D. L. R. headquarters are assigned a signal officer and men whose job is to keep the wires, switchboards and instruments in working order.

The number of cars per train varies widely. In the rear area one steam locomotive may haul on fairly level track nine 10-ton cars of ammunition or 12 cars of R. E. stores. These loads must be reduced in wet weather. As for the performance of light railways in carrying troops, one British officer told me that in his army zone alone as many as 160,000 had been carried in one day.

As an indication of the relative amounts of the various materials which the light railways haul, the following figures, representing a month's traffic on a certain section of line operated by American troops, is of interest, although I do not know whether these figures could be considered typical, for they are now several months old: Ammunition, 4522 tons; rations, 6284 tons; personnel, 3281 tons; light-railway ballast, 7277 tons; salvage, 4144 tons; miscellaneous, 6992; total, 32,500 tons.

I am, of course, not at liberty to state the tonnage carried by the British light railway system, the figures for which I saw, among other records, at the headquarters of the Director General of Transportation, but in lieu of something specific this observation is pertinent: During the course of my trip over a good many hundreds of miles of highway, the routes were unobstructed and I noted scores of empty motor trucks, parked and idle along the roadsides and in adjoining fields, both by day and by night. They told a silent, though none the less convincing, story of the work the light railways have done in the relief of traffic congestion behind the British front.

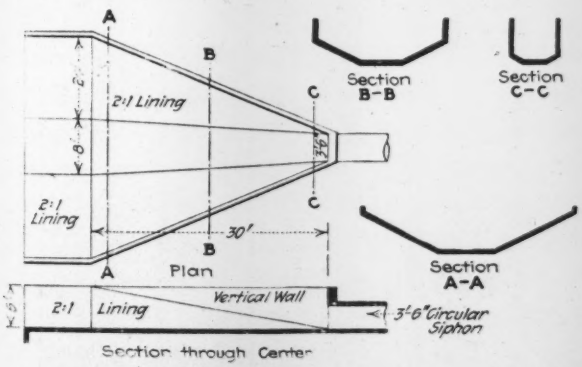
Keeping Down Cost and Head Loss on Siphon Outlets

Transition from Circular Pipe to a Standard Shaped Irrigation Canal Made by Paved Slope Section

IN DESIGNING the transition section from the outlet of circular siphons to canals of standard section, the South San Joaquin Irrigation District in California has tried several methods of keeping low the loss of head of water.

The theoretically correct warped section is costly and the purpose has been to substitute something approximating it in efficiency at low cost. One of the methods which has been found successful is indicated in the accompanying sketch.

In this design the transition section is made entirely of concrete and begins at the mouth of the circular siphon with a rectangular cross-section whose vertical walls are tangent to the circumference of the circle. This box section is gradually changed to the standard slope of the canal as the width of the transition section increases, by reducing the height of the vertical wall and increasing the height of lining on the standard 2 to 1 slope.



INEXPENSIVE TRANSITION FROM SIPHON TO CANAL

The advantage of this design is that the formwork required is very simple. The concrete lining on the floor and the 2 to 1 slope is placed without forms just as in the standard section, so that no carpenter work is required other than the two triangular forms for the vertical walls, 35 x 6 ft. in size, for a 3½-ft. siphon. Reinforcing steel is run through the floor and the lining up into the vertical wall.

At the beginning and end of the transition the cross-sections are the same as for the theoretically correct warped surface, the greatest variation being at the middle of the transition section. However, the head losses in sections, built as described in the foregoing, have been so low that it is not considered warranted to allow the additional expenditure for warped surfaces even in a district where the conservation of head is very desirable.

R. W. Olmsted is chief engineer of the South San Joaquin Irrigation District.

Large and Small Water Leaks Stopped in Ottawa

Water waste in Ottawa, Ont., amounting to from 3,000,000 to 3,500,000 U. S. gal. per day were located and for the most part stopped in 1917, according to the last annual report of W. E. Macdonald, water-works engineer. Three leaks totaling over 2,000,000 gal. per day were located by means of a pitometer. Two valves under water were found to be leaking badly at the spindle, one of them at the rate of 120,000 U. S. gal. per day. During the year four inspectors made a house-to-house inspection of all domestic and commercial water services, totaling 38,356. Leaks numbering 6167 were found, mostly defective taps and cisterns. The work was under the immediate direction of C. V. Putman, assistant engineer.

More Views Along the British Front by Light Railway

All Pictures British Official Photographs

BOLTING RAIL SECTIONS UNDER SHELL FIRE

THE HAND-CAR IS A PART OF THE EQUIPMENT

BETWEEN THE TIES IS READ THE TRAGEDY OF CITIES THAT ARE NO MORE—
COLLECTING DEBRIS OF BUILDINGS FOR USE AS BALLAST

PUTTING IN BALLAST—THE WORK IS SUBJECT TO SHELLING AND ALL ARE WEARING "TIN HATS"
This section of track parallels a highway and will relieve the latter of much heavy traffic

DODGING IN AND OUT OF RUINED VILLAGES. THE LIGHT RAILWAY OFTEN REQUIRES SHARP CURVES

OCCASIONALLY A HEAVY CUT IS REQUIRED FOR LIGHT RAILWAY CONSTRUCTION, ALTHOUGH GENERALLY THE LINE FOLLOWS THE GROUND SURFACE

WHERE IT CAN BE OBTAINED WITHOUT TOO LONG A HAUL "MINE EARTH"—WASTE PRODUCTS OF COAL MINES—MAKES A FAIRLY GOOD TRACK BALLAST

BENDING RAILS IN THE FIELD—BOLTING UP RAILS TO STEEL TIES

BRINGING IN WOUNDED BY PETROL TRACTOR—AN IMPROVISED HOSPITAL CAR

THE LIGHT RAILWAY AS A CONNECTING LINK BETWEEN ADVANCED DRESSING STATION AND THE HOSPITAL—ALL GAS MASKS IN "ALERT" POSITION ACROSS CHESTS OF MEN

UP NEAR THE FRONT WHERE SMOKE AND STEAM FROM A COAL-BURNING LOCOMOTIVE WOULD DRAW THE ENEMY'S ARTILLERY FIRE, THE PETROL-ELECTRIC TRACTOR IS USED EXTENSIVELY

Both the officer and the driver, it will be observed, carry gas masks ready for instant use

Irrigation Made City Drainage System Necessary

Drains Laid Below Sewer in Same Trench—Double-Bottomed Manhole Serves Both Sewers and Drains

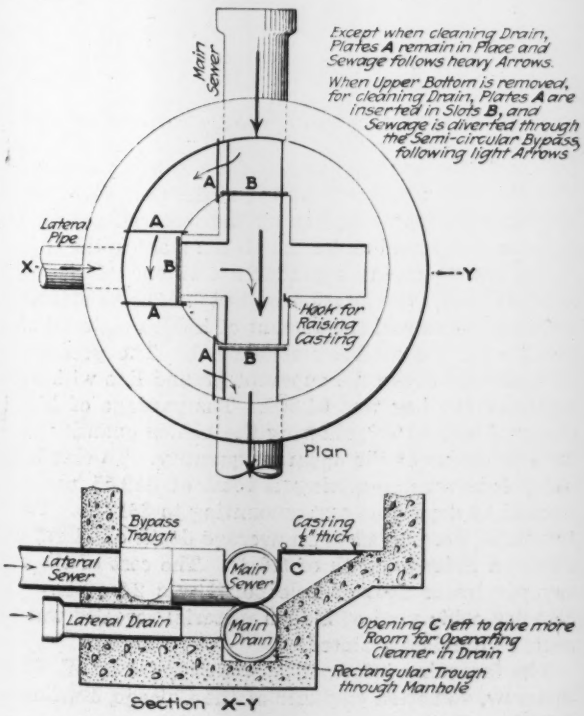
By H. S. Kleinschmidt

of Brown & Kleinschmidt, Civil Engineers, Salt Lake City, Utah

IRRIGATION in the city and surrounding territory having raised the ground-water level to the surface, the city of Richfield, Utah, has recently built a soil drainage system and at the same time provided sewers. Drains and sewers are in the same trench. Common manholes, with double bottoms, are used.

Richfield, with a population of 3500, is situated in a typical intermountain valley at an elevation of from 50 to 150 ft. above the floor, the lowest portion being at a distance of two miles from the Sevier River. The valley is irrigated from a distance of about ½ mile above the upper edge of the city to the river, a total distance of 3½ miles. The slope away from the foothills toward the river varies from 2 to 0.2 ft. per 100 ft., the least slope within the city being about 1 ft. per 100 ft. The precipitation is only about 8 in. a year, and half of that is snow. The soil and subsoil to a considerable depth range from a fine sandy loam to a tough clay.

As is common in most irrigated regions, considerable areas, progressing from the lower portions upward, became waterlogged, until practically all the land between the city and the river was unfit for cultivating crops, and was devoted to wild hay meadows and pasturage. The water table within the city rose steadily until over the lower portions it reached the surface of the ground. On the principal business street of the city practically all the cellars and basements have been flooded.


Except when cleaning Drain, Plates A remain in Place and Sewage follows heavy Arrows.
When Upper Bottom is removed, for cleaning Drain, Plates A are inserted in Slots B, and Sewage is diverted through the Semi-circular Bypass following light Arrows.
Main Sewer
Lateral Pipe
X
Y
A
B
Hook for Raising Casting
Plan
Bypass Trough
Casting ½" thick
Lateral Sewer
Main Sewer
C
Lateral Drain
Main Drain
Opening C left to give more Room for Operating Cleaner in Drain
Rectangular Trough through Manhole
Section X-Y

DOUBLE-BOTTOMED MANHOLE COST ONLY $10 EXTRA

The installation of drains and sewers being an innovation in that vicinity, and there being opposition to a bond issue large enough to cover the entire city, it was decided to install trunk lines sufficiently large to care for future population and such laterals as would serve the most severely affected portions. A preliminary estimate showed that $25,000 would cover this work, and bonds to that amount were authorized by popular vote.

No provision for storm water was needed, as the irrigation ditches on both sides of the streets serve to catch the very infrequent runoff from rainfall.

Septic tank treatment of the sewage was adopted because (1) there was no objection to discharging the tank effluent into surface drains, there to commingle with water used for irrigation of meadows immediately below the city; and (2) because a septic tank is cheap, "fool proof," automatic in operation and requires cleaning only at long intervals.

Separate sewerage and drainage systems were adopted, with the drains directly under the sewers. The reasons for this arrangement were threefold: (1) It is practically impossible to build a small sewer with water-tight joints under considerable exterior hydrostatic pressure, and it was desirable to have nothing but sewage to treat in the septic tank—all the more so because of the relatively large volume of drainage as compared with sewage; (2) for construction purposes it insured always a firm dry base on which to make good sewer joints, and added to the security of foundation in bad ground; (3) it afforded additional depth of drainage equal to the diameter of the tile.

The soil below a depth of 3 to 4 ft. over all the lower part of the system was a "loblolly," thin mud which could be neither shoveled nor pumped out. It was necessary to bulkhead short spaces, as little as 10 ft. at a time, inside the sheathing, and remove the mud in buckets by hand. A foundation of 2-in. plank, sometimes in two thicknesses, on 2 x 6-in. cross sills, with coarse gravel under these, was used in the worst places. At one point 10 cu.yd. of gravel was used in making a foundation for a manhole after sheathing was driven below grade and allowed to remain in place. Being remote from any extensive equipment, and the job being of small size, it was not feasible to employ methods under more favorable conditions.

Standard bell-end salt-glazed sewer-pipe was used for both drain and sewer. The drain was laid with open joints, care being exercised not to butt the ends too closely, to prevent sediment from sealing the joints and preventing free entry of water. Around each joint of the drain, coarse, clean gravel was deposited, the amount depending on the nature of the material encountered at grade. Gravel containing a considerable amount of small particles or sand is not suitable for filling around bell-end joints. The fine particles, together with mud, make a practically water-tight joint. When coarse gravel is used more mud enters the joints, to start with, but the tendency to seal up is lessened very much or prevented altogether. Sometimes the trench was filled with gravel all along the drain, completely covering it. Otherwise, dry earth in small lumps was spaded around the drain, covering it, to form a cushion on which the sewer was laid. Oakum and cement joints were used for the sewer.

To afford access to both sewers and drains, the double-bottomed manhole shown herewith was designed. Drain inspection and cleaning will doubtless be necessary, because tree roots will find their way into the drain, in spite of the cutting down of water loving street trees, such as willows, cottonwoods, poplars and elms. The ground slope is such that laterals will enter main lines from one direction only, so that manhole bottoms are all "blind" on one side. The extra cost of the double-bottom manhole over ordinary manholes was about $10 each.

Most of the work was done during midwinter with temperatures as low as —20° F. Where ground water was more than 4 ft. from the surface a Parsons trench excavator was used in cutting to about water level. The machine was followed closely with cross bracing spaced from 10 to 20 ft. c. to c. Hand excavation followed, the amount of timbering used depending on the nature of the ground.

Wet basements of abutting property were usually freed of water as soon as the drain was laid. In a few cases, where the subsoil was of unusually tight clay, drains laid directly into the basements were required. Considerable difficulty was experienced through choking of drains, with mud, but in all cases this was overcome by flushing with a hose under moderate water pressure.

The septic tank is constructed entirely of reinforced concrete, including the roof. It has two compartments, each 10 x 40 ft. in plan, with a sewage depth of 8 ft. at the inlet and 7 ft. at the outlet end. The only available location was in a swamp.

Quantities of work and contract prices for the entire work were as follows:

Septic tank complete		$2,127
10 in. sewer 0-10 ft. cut, ft.	3900	
10 in. sewer 10-13 ft. cut, ft.	750	
8 in. sewer 0-10 ft. cut, ft.	4100	
8 in. sewer 10-14 ft. cut, ft.	1175	
6 in. sewer 1-10 ft. cut, ft.	6100	
6 in. sewer 10-13 ft. cut, ft.	1300	
8, 10, 12-in. drain, ft.	7800	
6 in. diam., ft	1300	
27 manholes		18,467
247 cu.yd. of gravel for trench		1,380
13,762 B. m. ft. lumber for trench		494
247 Ys for house connections		963
		222
		$23,653

Both sewers and drains have worked successfully and have been extended this year. The writer had entire charge of the work from its inception.

More Fill in Railroad Embankment Below Than Above Ground

Test Borings in Illinois Peat Bog, at Cost per Yard of 0.4 Cent, Show 30% More Hidden Than Apparent Material

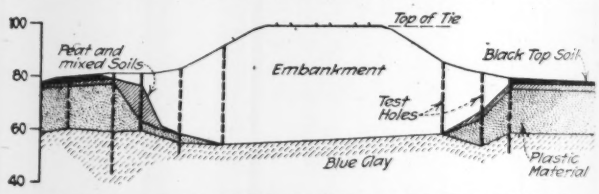
A HIDDEN quantity of material 30% in excess of the apparent amount was found by the valuation department of the Chicago, Burlington & Quincy R.R. in a peat bog in northern Illinois. At a cost of $312.80 material amounting to 80,000 cu.yd. was found, mainly by means of test borings. The cost per yard was therefore 0.4c. The bog was under a 20-ft. fill which extended both ways from the bog. The entire extent of the latter was only 1100 ft., and the appearance of the ground surface was no different from that on either side of it.

The roadbed at this point carries three main tracks. The first main was built in 1863, the second in 1871 and the third in 1890. Little is known of the difficulties encountered with the first two tracks, but it is well known that in the case of the third much trouble was experienced from the settlement of the embankment, and for a number of years it was necessary to haul in considerable quantities of material at periodic intervals, although the records of the quantities placed are not available.

To ascertain the extent and the amount of subsidence, test holes were put down by means of a 2½-in. wood auger attached to a ¾-in. gaspipe cut into convenient lengths. Trenching was resorted to at a few points, but did not give as satisfactory results as the test holes.

Where undisturbed, the bog showed a top stratum composed of a black dirt which gradually turned into a stratum of brown crumbly material known as peat. Under this was a plastic mass, gray, which after a few feet turned to a greenish color. It was possible to push the auger through this stratum without turning it, the whole gave off a strong odor of marsh gas, and when the auger was withdrawn the hole closed at once. Under this mass a stratum of stiff blue clay was found, and at succeeding depths this material was found to become harder, with a tendency to contain gravel.

Tests on either side of the bog developed a different formation, in which no subsidence was found. The surface material was the same as for the bog. Under it a blue clay was found, containing streaks of yellow which gradually disappeared, leaving the material exactly the same as that found under the plastic mass in the bog.



TYPICAL CROSS SECTION NEAR MIDPOINT OF BOG

The accompanying reproduction of one of the cross sections shows the location of test holes, the strata revealed by them and the amount of hidden material compared with the visible embankment. The yardage of embankment above the apparent ground line within the limits of the bog was 61,300. The yardage of hidden material was 80,000, showing the hidden quantity to be 30% in excess of the apparent quantity. To obtain the date, four men, receiving a total of $19.55 per day, worked 16 days, this cost amounting to $312.80. Fifty-two holes were bored to an average depth of 21 ft., and 25 to an average depth of 6.6 ft. The cost of the survey per linear foot of hole bored was 24 cents. The cost per cubic yard of hidden material revealed was 0.4 cent, as previously stated.

The foregoing information was supplied by W. W. K. Sparrow, valuation engineer of the Chicago, Burlington & Quincy Railroad.

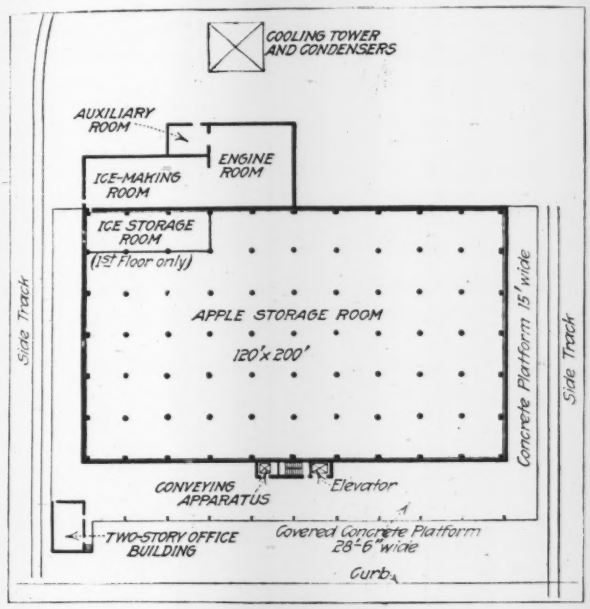
Simple Design Marks Cold Storage Building for Apples

Reinforced-Concrete Frame and Flat-Slab Floors with Hollow Tile Walls Separated by Cork Insulation—Special Detail Insures Tight Fit at Elevator Doors

By Stewart T. Smith

Architectural Engineer for Van Rensselaer H. Greene, New York City

A REINFORCED-CONCRETE building for the cold storage of apples completed last fall at Winchester, Va., is a good example of the simplicity of design, with resulting low cost, which is desirable in the present days of high prices. Details were so devoid of com-



COLD STORAGE BUILDING TO HOLD APPLES HAS SIMPLE LAYOUT

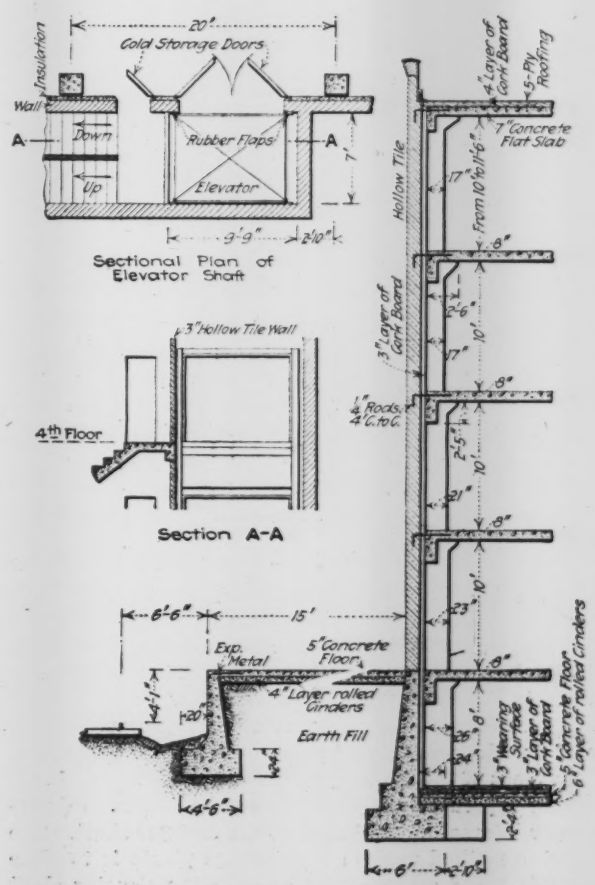
plication as to permit construction by the owner, under direction of an engineer but without the interposition of a contractor's organization; and the cost, at a time of exceptionally high unit prices, ran about $1.10 per sq.ft. of floor area for everything except the insulation work.

The building is used entirely for the storage of apples, and is, so far as the writer knows, the largest building in this country which is used solely for this purpose. It occupies an area 120 x 200 ft. and is four stories with a basement. In connection with the main building is an engine room 40 x 40 ft., an ice-making room 25 x 60 ft., a covered concrete platform along the front of the building, which it is intended will be inclosed by steel roller lift doors, and a small two-story office building at one corner of the platform. A side track runs along each end of the building.

The frame is of reinforced concrete with a flat-slab floor having a four-way system of reinforcing. Columns are spaced 20 ft. centers in both directions. There are no dropped panels, but the caps of the columns are made large. The dropped panels were omitted to simplify and reduce the cost of formwork and to place the refrigerating pipes nearer the ceiling than would be possible with a dropped panel, a desirable feature from an engineering standpoint.

The rods of the slab were not bent at the inflection joint, as is recommended by the Joint Committee and several building codes, but are held near the top of the slab at the column by eight radial rods and two concentric rings. The weight of the rods caused them to fall to the bottom of the slab near the center of the panel. They were held in position by special rod spacers. The omission of the bending of these rods resulted in a saving of about $1200. There are no openings in any of the floors, so that the laying of the steel as well as the building of the forms was greatly simplified.

The columns are reinforced with vertical rods and spiral hoopings. The percentage of steel was kept low



SIDE WALLS, FLOORS AND ELEVATORS KEPT SEPARATE

as it was found that with the present high cost of steel it was more economical to have a larger column.

A concrete retaining wall around the building holds the earth fill under the platform. On top of this wall a 12 in. hollow tile wall about 46 ft. high completely inclosed the building, being tied at intervals to the frame. A hollow tile wall was used in place of a brick wall because the material was cheaper and it could be built faster. Furthermore, by the use of hollow tile, 1 in. less of insulation could be used, a saving which amounted to approximately $2600. No attempt to make the exterior artistic by the use of costly pilasters and cornices was made, but a 5 x 8 in. smooth-faced tile was used, giving a most pleasing effect. The wall is built entirely separate from the concrete framework, a space of 4½ in. being left between, in which the insulation was placed. In the wall beams at each floor ¾-in. rods were set and when the wall was built these rods were bent over into the hollow tile, thus holding the wall securely in place.

The temperature of the air in the building is kept at about 30° F. to reduce the refrigerating load. The whole building, with the exception of the bases of the columns, is entirely inclosed in cork-board insulation. At the basement this insulation was placed on top of a concrete floor which rested on a shallow cinder fill and was covered with a 3-in. concrete wearing floor. On the roof an additional 5-ply roofing protects the insulation.

In front of the building an elevator, stairway and conveying apparatus are placed in one hatchway. Of particular interest is the design of the elevator shaft. The common method used in cold storage plants is to place what is called an anteroom between the elevator shaft and the cold-storage rooms. The contents of the elevator are placed in this room, the door closed between the anteroom and the elevator shaft and then the contents taken in to the cold-storage rooms. By the construction used in this building it is possible to empty the contents from the elevator directly into the cold-storage rooms with no greater loss of refrigeration than is experienced with the use of the anteroom. The elevator shaft is made 5 in. wider than the car of the elevator. Four ⅞ x 6-in. boards are fixed to the walls, as shown in the accompanying drawing. The masonry under each door is corbeled out to be flush with these boards. Above each door a ⅞ x 6-in. board is set between the two vertical boards. The car of the elevator is made 6 in. higher than the opening of the door. Around the edge of each side of the elevator is fixed a rubber flap and this rubber flap slides up and down the vertical boards as the car travels. When it stops at any floor, the space between it and the walls is entirely closed by these flaps, thus enabling the doors to be opened as long as it may be necessary without a rush of warm air up the shaft and into the rooms.

FLAT SLAB STEEL WAS NOT BENT AT INFLECTION POINT BUT WAS DRAPED TOWARD CENTER OF PANEL

No sprinkler system is used, because the cost of the necessary dry pipe would not have been offset by the additional reduction in the insurance rate. A fire wall, with no openings in it, is between the engine room and the main building. Tin-clad cold-storage doors were used throughout. It was found that these items in particular considerably decreased the cost of insurance. It could have been further decreased by dividing the large rooms into smaller rooms, but the cost of these walls was not justified by the reduction in insurance rate, which, as finally obtained, was 21c. per 100.

The concrete for the main building was mixed in a ½-yd. mixer. This mixer was kept running about ten hours per day from the time concrete was poured on the first floor until the roof was poured. Another ½-yd. mixer was used for the retaining walls, basement floor and platform floors. The concrete slabs were finished as they were laid and because of a shortage in labor and the fact that only a small mixer was available it was necessary to pour a section 20 ft. wide across the building at a time, thus making a construction joint in the center of each panel. This is shown in one of the views. A key was made at each construction joint by nailing a 2 x 3 in. strip onto the dividing board and the edge of the old concrete was wet and cleaned before the new was placed. Some of the floors of the building have been loaded to capacity, and no cracks or excessive deflections have appeared at construction joints.

The construction work was begun about June 1 and the first concrete was poured on the first floor the first of July. Refrigeration was on the lower two stories and the first apples were put in storage on Sept. 22. While this is no remarkable record for rapid construction, it is quick time considering the fact that it was not Government work and was done when the cantonments were under construction and embargoes were on most material not strictly for Government orders. The owners rented a contractor's equipment and also arranged for the contractor's supervision of the labor, but all material was purchased and all labor was hired by the owners. The engineer made frequent visits to the plant during the progress of construction and gave directions for carrying on the work.

The design of the buildings and the refrigerating equipment and the superintendence of the construction work was done under the supervision of Van Rensselaer H. Greene, refrigerating engineer, of New York City.

Great Britain Working on After-the-War Problems

Ministry of Reconstruction, Aided by an Advisory Council, Is Building Bridge to Carry the Nation Over from War to Peace Industrial Conditions

By Wingrove Bathon
Washington Representative, Engineering News-Record

PREVIOUS articles in this series have suggested and urged the appointment, by the President of the United States, of a readjustment and reconstruction commission, to begin to deal now with vital problems in industry which will press for solution after the war. It was pointed out that many other countries, notably Great Britain, have already begun to attempt to solve after-the-war problems, and the personnel of a suitable commission, selected from the ranks of American industry, was presented in the first article in this series (*Engineering News-Record* of May 30, p. 1031), the second article (June 6, p. 1092) having dealt with the personnel suggested for a suitable advisory council, taken from the ranks of Government officials, to work with such a commission.

A description of the far-reaching work being done along this line by Great Britain is now presented as an evidence that it is necessary for American industry to begin now, through a readjustment and reconstruction commission—preferably the President's own commission, responsible only to him—to prepare to solve after-the-war problems. It may be as well to state at the beginning that this description of Great Britain's Ministry of Reconstruction is taken from the official reports to Parliament of the British War Cabinet, furnished to the present writer for the purpose of this article by Arthur Willert, secretary of the British War Mission at Washington. These reports are inclusive of the year 1917 and have just been received in Washington.

To Solve Problems of Utmost Importance

After tracing the earlier stages of the Ministry of Reconstruction in Great Britain, before the ministry was established by the New Ministries Act, in July, 1917, and when and during the time the agency of reconstruction consisted of a committee of ministers of the crown, the War Cabinet reported that it was found necessary to establish a Ministry of Reconstruction to continue for the duration of the war and for a period of two years, or less, after its conclusion. It was declared that a prime minister upon whose shoulders fell the responsibility for the conduct of the war could not assume personally a day-to-day responsibility for guiding the reconstruction committee's work. It was stated that the Government had throughout been aware that as the war continued, and its pressure upon every side of the national life increased, the intensity of the struggle in itself enhanced the importance of the reconstruction problems which had to be faced; and that Parliament and the country were not slow in realizing that there was coming into existence a series of questions of the utmost importance to which answers must be found, not after, but before, the conclusion of the war.

Work of Minister of Reconstruction

The functions of the Minister of Reconstruction then appointed, and who assumed office in August, 1917, are defined as follows:

"To consider and advise upon the problems which may arise out of the present war and may have to be dealt with upon its termination, and for the purposes aforesaid to institute and conduct such inquiries, prepare such schemes, and make such recommendations as he sees fit; and the Minister of Reconstruction shall, for the purposes aforesaid, have such powers and duties of any Government department or authority which have been conferred by or under any statute as His Majesty may by Order in Council authorize the

Minister to exercise or perform concurrently with, or in consultation with, the Government department or authority concerned."

In other words, as was brought about during the debate which resulted in the creation of the ministry, the minister in charge does not exercise executive functions. He appoints committees; initiates experiments; frames schemes for action with a view to conditions after the war; his powers are not exclusive and do not shut out other departments; he assists the other departments, provides them with information and helps them "to build a bridge which will safely carry us over from war to peace conditions." The British Parliament found that the creation of a reconstruction agency was desirable because various Government departments are approaching various problems in their own way, each drawing up reports or memoranda, and that what was needed was a coördinating element, not especially attached to the work or to the traditions of any one of the departments concerned. The Solicitor General of Great Britain, speaking in debate, said that what was needed was "a comprehensive coördinating mind, a fresh mind, and at the same time an authoritative mind, who will bring together the several contributions of the various specialized departments."

The Ministry of Reconstruction was then formed. For the purposes of administration the department was divided into branches dealing respectively with commerce and production, including the supply of materials; with finance, shipping and common services; with labor and industrial organization; with rural development; with the machinery of government (central and local); with health and education; and with housing and internal transport.

Advisory Council Appointed

The Minister of Reconstruction than appointed an advisory council, "representative of all the leading interests concerned in reconstruction, and it is his hope by consulting the council freely and regularly to secure a representative consensus of opinion on any proposal which may be referred to him for advice or which may be initiated in the department." This council is organized very much as the Pan-American Financial Conference held in Washington at the beginning of the war was organized, and very much as the old War Industries Board of the Council of National Defense of the United States was organized. In other words, there are experts in each line named to serve with Government representatives. The council is divided into sections, just as the administration of the Ministry of Reconstruction is divided. It is stated that "the membership of the council has been so arranged that in each section all the principal interests represented on the council should find a place; thus, there are representatives of labor on the finance section as well as financiers; there are business men as well as agriculturists on the section dealing with agriculture, and so on."

The meetings of the sections of the ministry and the council are private, but it is known that they have already dealt with the standardization of railway equipment; the post-war rationing of industries; the establishment and functions of trade organizations; the organization of rural information centers; the establishment of industrial courts; house planning from the point of view of domestic economy; the future organization of voluntary women's work; and the conditions required for maintaining a supply of efficient agricultural labor.

The section dealing with commerce and production is investigating (1) the supply and control of raw materials after the war; (2) financial facilities for British commerce and industry after the war; (3) the preservation of industries which will play an essential part in reconstruction, but are in process of extinction through failure of supplies of material or labor; (4) financial risks attached to the holding of trading stocks; (5) trusts and combinations, with special reference to the protection of the consumer; (6) the establishment of new industries after the war, a committee having been especially appointed to consider this question as far as the engineering industries are concerned, a parallel committee looking after the labor questions involved; (7) the volume and nature of the demand for British goods after the war, and (8) improvements in trade organization for the purpose of more economical production, distribution and marketing, and expediting the turnover from peace to war.

The section dealing with finance, shipping and common services is, in conjunction with the treasury, considering the question of currency and exchange after the war; and under this section an advisory council section is at work on the disposal of Government stores after the war.

The section dealing with labor and industrial organizations has agreed with the British Board of Trade and the Ministry of Labor that "a concerted effort should be made to promote in as many industries as possible representative organizations to advise the Government as to the views and needs of the industries in meeting the various industrial and commercial problems that will affect them during the reconstruction period. The Ministry of Labor is to proceed with the formation of permanent industrial councils. A conference of trade organizations is being established at the Ministry of Reconstruction, consisting of three employers, three trade unionists and representatives of the Board of Trade, the Ministry of Labor and the Ministry of Reconstruction. The Minister of Reconstruction has decided to refer to the industrial section of the advisory council the question of establishing corresponding organizations in engineering and in railways.

Reports on Labor

This section (dealing with labor and industrial organizations) is farther along with its work than any of the other sections, apparently, for reports have been submitted on unorganized trades and works, and probably, by now, on conciliation and arbitration; a general survey of industrial policy as a whole has been prepared, going into the questions of law and labor in merchant shipping; wartime departures from trade union practices; industrial courts; industrial structures; apprenticeship; the reinstatement of returning soldiers and sailors, and international labor legislation. Furthermore, surveys have been undertaken of indus-

trial methods, and inquiry is being made into juvenile employment. The question of army demobilization, it has been settled, makes the Ministry of Labor responsible for the returned soldier or sailor, and the Ministry of Reconstruction is to determine the priority of different trades. A complete list of public works which have fallen into arrears has been prepared so that surplus labor may be usefully and rapidly employed, and the Ministry of Munitions has begun work on the special problems arising out of its work.

The section dealing with rural development is examining the (1) working of the Small Holdings Act and the future of urban war allotments; (2) a report made by the forestry committee; (3) the rural housing problem; (4) the organization of county offices for advice on agriculture; (5) tithe redemption; (6) village industries, and (7) the report of the land acquisition committee.

The section dealing with machinery of government, health, education, etc., is negotiating through a committee on the distribution of functions in regard to the formation of a Ministry of Health and is studying reports which have been made (1) on the functions of the poor law authorities, and (2) on adult education.

The section dealing with housing and internal transport, with a view to facilitating work in connection with housing, has set to work committees on (1) supply of building materials; (2) house building construction, and (3) building by-laws. Special investigations are being made by this section on (1) control of public utility societies; (2) town planning; (3) rings in the building trade; (4) the working of the Small Dwellings Acquisition Act; and a general review of the problem of inland transport is being made, the portions dealing with roads and canals having been completed. Furthermore, the ministry is in consultation with the Board of Trade concerning the future of the railways (including light railways) of Great Britain and an inquiry has been begun into the question of storage and distribution as essential elements in the future transport policy.

Work of Various Sections

This article is intended to be but a brief outline sketch of the monumental amount of work being done by the British Ministry of Reconstruction, but it might be well here to hark back for a moment or two to some of the points being taken up by the various sections. In the section dealing with commerce and production, the report of the British War Cabinet to Parliament states that the question of the "volume and nature of the demand for British goods after the war" and the question of "improvements in trade organization for the purposes of more economical production, distribution and marketing and of facilitating the turnover from peace to war," are being handled in consultation with the British Board of Trade and the Department of Overseas Trade, and that a "comprehensive scheme of work has been prepared." The British Cabinet thus states the problem:

"After the war there will be a world shortage of certain materials and the shortage will be accentuated by the difficulty of finding tonnage adequate to our demands. On the other hand, there will be an almost unlimited demand for manufactured goods."

The comment of the Cabinet report in this connection will be found interesting, perhaps. After stating that the results of inquiries will be used to determine in what order demands of the trades at home and of the colonies overseas shall be met, and "in what proportion raw materials shall be directed into certain channels, in what directions the demands for labor, power tonnage and credit are likely to be most intense," it is stated:

"It is not a question of arbitrary restriction or of protecting some industries or developing others—it is a question rather of directing to the most productive purposes such materials as will in fact be available, and of furnishing industry with the necessary facilities, including information, for making these purposes effective. The desire of the Government is to leave the industries to ration themselves under certain general principles for which the Government must take responsibility. What those principles should be and what form of central machinery should be devised for this purpose is one of the first questions on which the advisory council is asked to report."

Convenient Bag for Valuation Field Men

A BAG which has been found very useful in field work on valuation, writes a correspondent, consists of an ordinary two-pocket brief case to which have been added three accessories—a large pocket on one side, rings and a shoulder strap, and two straps to hold a roll of blueprints, or, when the weather is showery, a folding umbrella. The shoulder strap has snaphooks to engage the rings. The pocket, which is dark against the coat, has gussets at the ends, which give it a large mouth, narrowing to nothing at the bottom. This makes it easy to drop into it tape, dead-man, keel and the like and to get them out. When one is in the field there are many times when both hands are needed, such as when climbing through cars or about bridges, and in measuring of all kinds. This bag leaves both hands free.

The two pockets are used, one to carry maps, the other pre-inventory and supporting data. The maps specified by the Division of Valuation are large and clumsy to handle in the field; by folding them accordion fashion to approximately 8 x 11 in., they can be carried easily in the case and examined without trouble, as shown in the picture.

Wichita Shares Profits from Feeding Garbage to Hogs

Contractor Collects and Disposes of Garbage, Paying City 10% of Net Income, With No Allowance for Capital Charges—All Under Sanitary Control

MODEL contracts for the collection of city garbage and for its disposal by feeding to hogs are so rare as to warrant the publication of one recently made by the city of Wichita, Kan. Briefly, the contractor agrees to collect all the garbage of Wichita for a period of three years and to pay for the exclusive privilege of so doing 10% of the net profits from feeding to hogs, not including capital charges in the expenses. The contractor is also to pay $1500 a year for the salary of a superintendent who is to act in behalf of the city. Provision is made for the sanitary control of both collection and feeding and for the checking of all the financial transactions of the contractor. L. R. Ash is city manager of Wichita.

Provisions of Model Contract

The contract, with the omission of some legal verbiage, is as follows:

1. The word garbage shall mean all organic waste or residue of animal, fruit or other vegetable matter from kitchens and dining rooms, or from the preparation of, dealing in or storage of meats, fowls, fruits, grains and vegetables.

2. For the exclusive right hereinafter granted, the contractor agrees that he will, at his own expense, collect, remove and dispose of all accumulations of garbage within the corporate limits of the City of Wichita, which garbage shall be placed by said inhabitants in conformity with the ordinances of said city, so as to be reasonably accessible to the wagons or vehicles of the contractor. Said garbage shall be taken by the contractor to such place or places as will meet with the approval of the commissioners of the City of Wichita, and shall be by said contractor disposed of by feeding to swine, under the provisions and intent of this contract, and under the conditions as shall be in strict conformity with ordinances now existing, or with such reasonable ordinances as shall hereafter be passed by the city not inconsistent with the terms of this contract.

3. The contractor shall collect and remove daily, all garbage from hotels, restaurants and eating houses, and from such other places, where garbage accumulates in large quantities, as may be directed by the commissioners or city manager. From residences and other places not included above, the garbage shall be removed at least twice each calendar week from Nov. 1 to Apr. 1, and at least three times each calendar week from Apr. 1 to Nov. 1, provided, that any building or dwelling where an average of 20 persons or more are fed daily, shall be considered an eating house for the purposes of this contract.

4. All garbage, in other than residence districts, shall be collected, during the night, between sunset and sunrise, from Apr. 1 to Nov. 1., and during the remainder of the year, garbage from said districts, and throughout the year, garbage from residence districts, may be collected at any time, provided that the commissioners may designate the hours for and manner of collection as in their discretion may be deemed wise and necessary.

5. The contractor, before beginning collections under this contract, shall divide the city into districts and shall deliver to the city manager a list of the boundaries of each district, and the days of the week on which he plans to make collection therefrom. The commissioners, within 30 days after the beginning of such collections, according to such districts, may make such changes, alterations and additions thereto as, in their judgment, are necessary to insure the efficiency and thoroughness of such collections. Thereafter on Nov. 1 and Apr. 1 the contractor shall revise such districts and deliver such revised lists to the city manager when they may be revised as described above. The contractor shall furnish each householder on Apr. 6 and Nov. 6 with a printed list of the days on which he will make collections, stating in such lists the time of day, as nearly as possible, when such collection will be made.

6. The contractor shall feed the garbage on concrete floors and in a thoroughly sanitary manner and the swine shall be supplied with ample food and pure water and properly housed in structures of wood or other suitable material, provided with ample means of being thoroughly cleaned daily; the offal from feeding floors and sleeping quarters shall be disposed of in a sanitary manner by collecting same and applying lime in sufficient quantities to prevent its becoming in any manner offensive or a nuisance.

The contractor shall feed such garbage under the supervision and inspection of a licensed veterinarian in good standing and such licensed veterinarian shall make a report of his supervision and inspection once each month to the city manager and to such other authorities as may be by law required.

Contractor Makes Full Report to City

7. The contractor shall, at the time of commencing operations under this agreement, make a full and true inventory of all hogs, feed, supplies and all other property, purchased, leased, owned or used in the collection, removal and feeding of the garbage, and shall at the time of each transaction promptly and accurately show upon said inventory all additions made thereto in any manner and all deductions made therefrom by sale, loss or otherwise. He shall make a true and fair market valuation of all said stock and properties at the beginning, and show in the valuation accounts kept, the names of the persons, firms or companies from whom stock, property or equipment may be bought or otherwise obtained, the prices paid therefor and the terms of purchase or procurement, the weight and count thereof and likewise show the weight, count, price and terms of all sales or other disposals of stock and property and the names of the persons, firms or companies to or through whom the said property or stock

may be sold or disposed of. He shall keep a full and accurate account of all expense, costs, losses and gains incident to or derived from said business; shall keep cash and bank accounts and cause a plain and full record of every transaction to be kept and all business transacted in a manner and according to a system satisfactory to and approved by the commissioners or manager, and all files, letters received, and copies of letters written, papers, agreements and other documents and instruments together with all books, records, memoranda and other accounts shall be at all times open to inspection by the officers, manager or employees of the city delegated to examine same.

Calculation of Net Profits

It is further agreed that within 20 days after each Jan. 1 and each July 1 following the date of this contract, the papers, files, records, books and accounts of said contractor and of the superintendent herein provided for, relating to receipts, earnings, losses, expenses, purchases, sales of stock or property, and used in the conduct and management of said business of collecting garbage and feeding and disposing of the same, shall be audited by a certified public accountant, satisfactory to the city and the contractor, and on or before the first day of February and August first following said audit, the contractor shall pay to the City of Wichita in cash 10% of the net profits from the preceding six months' business. In determining the amount of net profits for each six months no consideration shall be given to investment in real estate, plant, vehicles, teams or equipment of any kind and no allowance shall be made for interest on the investment or for working capital, nor for depreciation, nor for any interest charge upon or deduction for intangible values. Net profits shall be held to mean what is left after deducting from the gross earnings from the sale of, and the increase in value of, such swine as are fed in whole or in part, upon the garbage collected by the contractor, the necessary proper and actual cost and expense of producing the same actually paid and expended by the contractor. Said cost and expense of producing shall include the original value of the hogs, plus all expense for labor in collecting the garbage and in feeding and caring for the hogs, plus the operating expense of maintaining all plant and equipment used exclusively in collecting and disposing of the garbage and in the proper care and handling of the hogs to which said garbage is fed. Depreciation of plant, tools, teams or other equipment shall not be considered an operating expense for the purposes of this contract. The value of the hogs at any time shall be determined by the market price prevailing at that time.

8. The contractor shall save and hold harmless the city from all damage, costs and expenses of every kind, character and nature whatsoever for the payment of which the city may become liable to any person or corporation by reason of the rights and privileges herein granted to the contractor or in any wise accruing by reason of this contract, or the work done under the provisions hereof.

And in the event of the breach of this agreement by the contractor then said contractor shall save and hold the city harmless from all expenses incurred by reason of said breach not exceeding the sum of $15,000 and said contractor shall at the execution of this contract, execute and deliver to the city a surety bond to be approved by the city in the sum of $15,000, conditioned that the contractor will comply with all of the conditions and requirements of this contract.

9. That in consideration of the service to be performed by the contractor, the city gives to the contractor the exclusive right for the period of three years to collect, remove and dispose of all garbage accumulated and deposited by the inhabitants of the city in accordance with the ordinances of said city governing such disposal.

10. That the city will have in force and effect during the continuance of this contract ordinances requiring the exclusion from garbage, by the inhabitants of the city, of all deleterious matter such as glass, tin cans, paper, ashes, poisons or other matter destructive or injurious to animal life; and requiring the placing of such garbage in proper receptacles reasonably convenient to access by the collecting wagons or vehicles of the contractor. Provided, however, that the city shall not be liable to said contractor for the violation of the terms of said ordinance or ordinances by any person, firm or corporation subject thereto, nor shall the said contractor be entitled to any deduction from the consideration due the city, as herein specified, on account of any such failure.

City May Employ Superintendent

11. The city shall have the privilege of employing a superintendent who shall have access daily to all bills, statements, papers, correspondence, files, records, books and accounts kept by the contractor pertaining to the business contemplated by this contract. The superintendent shall make reports to the city commissioners as may be required. The contractor shall provide the superintendent with telephone and office facilities such as will enable him to keep proper records and maintain a close and accurate supervision and knowledge of the work of collection and disposal, together with all expenditures and collections made by said contractor. The contractor shall also furnish and maintain a proper vehicle or machine for the use of said superintendent, to enable him to respond to all complaints from the residents of the city, and to superintend properly and require prompt and efficient performance of the requirements of this contract. The contractor shall pay the salary and reasonable expenses of said superintendent, which salary shall not exceed the sum of $125 per month.

12. In event the contractor shall fail, neglect or refuse to comply with any of the terms, conditions or obligations of this contract, the city may at its option declare said contract to be terminated, null and void. In event of the omission or failure or neglect of the contractor to comply with any of the said provisions hereof, the city shall first cause to be delivered to the contractor a notice stating the particular in which said contract is alleged to have been violated and if the contractor shall not within ten days thereafter comply with said provisions then this contract shall,

at the option of the city, be terminated as to the benefits and interests in favor of the contractor, and the city may take such steps as its commissioners or manager may deem advisable or proper to protect the city and its inhabitants and to provide the service contracted for herein, and collect from said contractor and his bondsmen all cost, expenses and damage resulting from such failure and efforts of the city to correct the same.

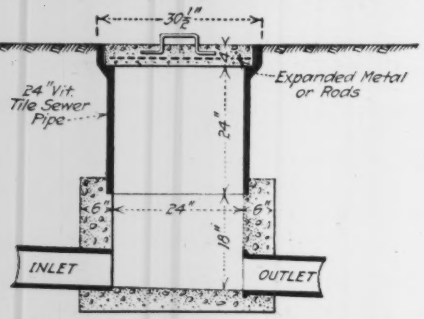
13. In the event of the termination or forfeiture of this contract, or at the expiration of the terms herein specified, the parties thereto shall mutually adjust the accounts and the contractor shall pay immediately the sum found to be due. And in event the parties are unable to agree, then the amount due the city shall be determined by three disinterested arbitrators, one to be selected by each of said parties and those two to select the third.

Manhole Top Made of Cast Concrete

By G. W. McAlpin
Point Pleasant, W. Va.

MANHOLES on several of the Ohio River locks and dams have been standardized, as is shown on the accompanying drawing by O. Butler, superintendent for the United States Engineer office at Wheeling, W. Va.

A 2-ft. section of ordinary 24-in. vitrified tile sewer



PRECAST CONCRETE PLATE FITS ONTO THE TOP OF VERTICALLY PLACED SEWER PIPE TO FORM MANHOLE

pipe forms the upper part of the manhole. It is set upon a concrete base, through which the sewer proper passes. The manhole top is closed by a reinforced-concrete lid having an iron handle. No special form is required to make the lid, as a section of the 24-in. sewer pipe, filled to the bell with earth, is used as the mold. Lids in use have proved entirely satisfactory even with hard usage.

Table Aids Spacing of Stirrups

By R. G. Young
Engineering Department, Procter & Gamble Co., Ivorydale, Ohio.

FOR computing U-bar spacing in reinforced-concrete beams, the writer has found by using the accompanying table (based on one of the shear formulas in common use) some time and much mental labor may be saved. The table will also be found a great help in changing U-bars already designed to an equivalent size and spacing, the necessity for which arises quite frequently owing to the shortage in stocks of certain sizes of bars.

The formula is as follows:

$$s = \frac{A_s \times f_s}{b(v - f_c)}$$

in which s = spacing in inches for any portion of beam of length l; A_s, area in square inches of two legs of U-bar; f_s, allowable stress on steel in pounds per square inch = 10,000 in table; b, width of stem of beam; v, shear per square inch on average section of length l, or V/bjd; f_c, allowable stress on concrete per square inch = 65 lb. in table; $b(v - f_c)$ = shear per linear inch of beam to be taken by U-bars.

To use the table, trace horizontally from a given beam width to the figure nearest the computed value of v, then upward vertically to the figure opposite the size of U-bar most desirable. This figure will be the required spacing. Equivalent spacing for other bar sizes are in the same vertical column. U-bars ⅜-in. square, being most used, are given in even inches or half-inches.

If bent-up bars are relied upon for 0.4 of the shear not taken by concrete, use the upper half of table for that part of the beam. Use the lower half for the central part of the beam.

The table applies to any system of loading, and similar tables can be constructed using the unit stresses of any building code, other beam widths or a different coefficient of reduction for bent rods.

An important function of the table is the ease with which the necessity for any U-bars closer than a nominal spacing may be determined immediately if width, depth and unit vertical shear at support are known.

TABLE GIVES SPACING OF STIRRUPS IN CONCRETE FOR DIFFERENT SIZE BEAMS

	Size of Bar	Spacing in Inches																									
	½□	1 8	2 23	2 7	3 1	3 6	4 5	5 4	6 3	7 1	8 0	8 9	10 7	12 5	14 3	16 1	18	20	21	23	25	27	29	30	32
	½○			2 1	2 5	2 8	3 5	4 2	4 9	5 6	6 3	7 0	8 4	9 8	11 0	12 5	14	15	17	18	20	21	22	24	25
	⅝□					2 0	2 5	3 0	3 5	4 0	4 5	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	⅝○						2 0	2 4	2 7	3 1	3 5	3 9	4 7	5 5	6 3	7 1	7 9	8 6	9 4	10 2	11 0	11 8	12 6	13 4	14
	¾□										2 0	2 2	2 7	3 1	3 6	4 0	4 5	4 9	5 4	5 8	6 2	6 7	7 1	7 6	8
	¾○																	2 0	2 1	2 3	2 5	2 7	2 9	3 0	3 2
From point where rods bend up to support	Width of Beam 5½											227	200	181	167	155	146	139	133	127	123	119	116	113	110
	7½										216	199	186	165	151	140	132	125	120	115	111	108	105	103	100	98
	9½								205	188	174	163	147	135	126	120	114	110	106	103	100	98	96	94	92
	11½						227	200	181	167	155	146	133	123	116	110	106	102	99	96	94	92	90	89	88
	14						198	176	160	148	139	132	121	113	107	102	98	95	93	90	89	87	86	85	84
	16					211	182	162	148	138	130	123	114	107	102	97	94	92	89	87	86	84	83	82	81
	18				213	195	169	151	139	130	123	117	108	102	97	94	91	89	87	85	84	82	81	80	79
From point where rods bend up to center of beam	5½							227	204	187	173	162	146	135	126	119	114	109	106	102	100	97	95	94	92
	7½						209	185	168	155	145	137	125	117	110	105	101	98	95	93	91	89	88	86	85
	9½					212	183	163	149	139	130	124	114	107	102	98	94	92	90	88	86	85	83	82	81
	11½			227	204	187	162	146	135	126	119	114	106	100	95	92	89	87	85	84	82	81	80	79	79
	14		225	198	179	165	145	132	122	115	109	105	98	94	90	87	85	83	82	80	79	78	78	77	76
	16		205	182	165	153	135	123	115	109	104	100	94	90	87	84	83	81	80	78	78	77	76	75	75
	18	220	190	169	154	143	127	117	109	104	100	96	91	87	84	82	81	79	78	77	76	75	75	74	74

Heaving of Creosoted Wood Block Pavements Overcome

Absorption and Troubles Due to Shifting Sand Bed Eliminated by Substitution of Paint Coat for Sand Cushion

By Frank W. Cherrington
Chief Engineer, The Jennison-Wright Company

SWELLING and heaving of creosoted wood-block pavements is practically overcome, by laying the blocks directly upon a concrete base which has first been painted with bituminous material. This conclusion is amply justified by the condition of various pavements, from two to seven years old, which have been laid in several cities of the middle West. Properly spaced blocks laid in this way, with bituminous filler, are sealed on five of the six faces with waterproof material. The imperviousness which is thus secured keeps the blocks from swelling through absorption of water. This swelling and the consequent heaving have been inherent defects of wood block construction and the chief argument used against it. The disturbance of the surface of the finished pavement caused by the shifting of the sand cushion or by improper preparation of the mortar bed is also eliminated by this construction.

The practice of laying creosoted wood blocks directly upon a smoothly finished concrete foundation has been extensively followed abroad for many years, both with and without bituminous coating of the base. In this country, until recently, it was considered impracticable to lay blocks in this manner because of the difficulty of securing a smooth surface. However, economical methods of bringing the concrete to a smooth surface have overcome this objection, and as a result permanence of contour and rigidity of construction are being secured. The method was introduced here about six or seven years ago, in a small Minnesota municipality, and later the cities of Chicago, Pittsburgh, St. Louis and others laid the blocks under heavy traffic conditions.

The results have been so satisfactory that the City of Detroit, after much investigation, is using a large amount of the bituminous coating cushion with distinct success. This year it will also be extensively used, in Milwaukee, Cleveland and Newport, Ky. During the summer of 1917 the City of Toledo specified approximately 25,000 yd., much of which was for paving in car tracks. The method followed is described in this article.

In preparing the foundation, the concrete was first brought to a true surface and floated with a light metal concrete-roller. This process is shown in one of the illustrations. The roller compresses the concrete, removes the excess water, and forms a smooth base of uniform density. After permitting the base to set for five days, the surface was given a paint coating of coal tar pitch, having a melting point of about 140° F. The coating is shown in one of the accompanying pictures. This coat was poured on the foundation and spread with a squeegee.

ROLLER SMOOTHES AND COMPACTS THE CONCRETE BASE

As soon as the pitch had hardened the blocks were laid directly upon it in the usual manner, and the joints were filled with hot pitch to within 1 in. of the surface. The filler was squeegeed over the blocks while very hot, care being taken that a minimum quantity remained upon the surface of the pavement. The joints may be filled completely at the first application, and when the pitch cools a space of about 1 in. will be left in the upper portions of the joints. The remaining interstices between the blocks were then filled with dry sand. The purpose of the sand in the upper portion of the joints is the prevention of the exudation of the pitch from between the blocks in hot weather. The coefficient of expansion of pitch is so high that unless this precaution is taken the pitch will be forced in large quantities to the surface of the street. With the sand in the upper portion of the joints a mastic is formed which holds the pitch in place.

SQUEEGEE APPLIES PITCH COAT TO FOUNDATION

In the streetcar tracks and dummy strip, instead of placing a crown in the pavement, the ordinary construction was reversed. The surface was made concave instead of convex, and track drips were placed at intervals of from three to four hundred feet. In ordinary construction the crown in the streetcar tracks throws the water to the rail, and eventually it seeps under the pavement with subsequent damage to the pavement. The concave surface throws the water to the center, whence it is carried to the track drips and the sewer. Last summer the area between the tracks was concaved only 1 in., but this year it will be increased to about

1½ in. This construction for car tracks is satisfactory only where there is a sufficient grade to carry off the water properly. Although last winter was very severe in Toledo, the pavements built as outlined above came through it in almost perfect condition and with no heaving of the surface.

The cost of this type of construction is less, if anything, than that of the mortar-bed type. The floating of the concrete to a true surface is a very simple and economical operation. The paint coat of pitch is inexpensive, requiring approximately ½ gal. of pitch per square yard of surface. There is also a distinct economy in labor and a decided saving in materials necessary for laying the blocks, when compared with the mortar-cushion type of construction.

It has been found that coal-tar pitch, both as a coating and filler, gives much better service than asphalt. The tar adheres more tenaciously to the concrete foundation than the asphalt, consequently blocks will be held more firmly in position. Asphalt poured over concrete as a bituminous coating may be very easily peeled off in whole sections, while if pitch is used it requires about 150 lb. per square inch to pull the blocks loose. Asphalt can only be used successfully if a paint coat of light oil is applied to the concrete before the cushion coat is applied.

Construction Program Is Developed for Union Station at St. Paul

Seven Stages of Work of Remodeling Terminal and Elevating Tracks Have Been Scheduled to Limit Interference with Present Facilities—Work Expected to Be Finished in 1922 if Started This Year

THE extensive and varied work involved in building the new union station at St. Paul will occupy considerable time and necessitate temporary interference with and partial removal of existing station facilities. It was felt desirable, therefore, to plan the work in such a way as to minimize the inconvenience to the traveling public and the difficulty in handling the traffic during the reconstruction. A definite program of work divided into seven stages, or periods, has been adopted by the engineers. No time has been assigned for these periods, but in general the work of each will be completed before that of the next is begun.

The existing and the proposed layouts of the union station are shown by the accompanying plans; they were described in *Engineering News-Record* of June 7, 1917, p. 486. To summarize the plan, the 14 existing tracks, which are crossed at grade both by passengers using the trains and by two streets, will be replaced by 22 elevated tracks, additional land on the north side up to Third St. having been acquired. Since the partial burning of the old station in 1913, use has been made of an adjacent building, on higher ground on Third St., from which stairways descend to the track level. From the headhouse of the new station, which will face Fourth St., a concourse and waiting room will extend over the tracks, stairways descending to the platforms. Baggage, mail and express facilities will be provided under 13 of the tracks, which will be carried on a special track structure. The remaining tracks to the south will be carried on solid fill.

Following are the seven construction stages, as planned:

1. All buildings on the headhouse site to be wrecked, and all buildings on the Union Station Company's property east of the Griggs-Cooper building. The headhouse to be built. The coach yard east of the station to be abandoned, the new plan contemplating the provision by each road of coach facilities elsewhere. The Northern Pacific, Union Station and Great Northern tracks at the entrance to the union station grounds to be shifted southward to make room for building the north retaining wall.

Retaining walls and the team-track subway to be built from Broadway east, and the space between the wall and the present Great Northern passenger tracks filled. The north half of track structure from Broadway to the Griggs-Cooper building to be built. The coach yard to be filled to the new grade, and the space used for a construction material yard.

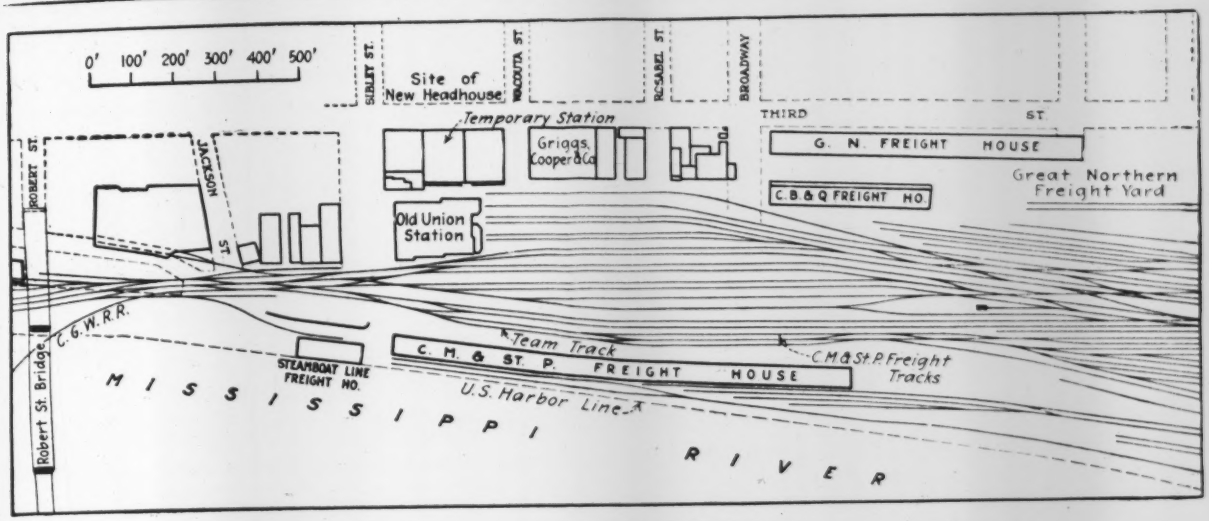
New turntable, engine-house and other engine-service structures to be built in the fork of the wye east of the station. The temporary elevated passageway to be built leading from the new headhouse and terminating at the present track level near present main concourse stairs.

2. The present station building to be abandoned and the new headhouse used, with its lobby serving for the temporary waiting room. All buildings south of Third St. to be wrecked except the old headhouse, this to be used temporarily for mail and baggage. The north half of the track structure over the baggage and express rooms to be completed, all underground utilities in Third and Sibley Sts. that require changing to be changed. Required tunnels and foundations to be built and the streets regraded and paved. The concourse waiting room to be built from the new headhouse across Third St. and half of the track structure, with elevators and stairways complete.

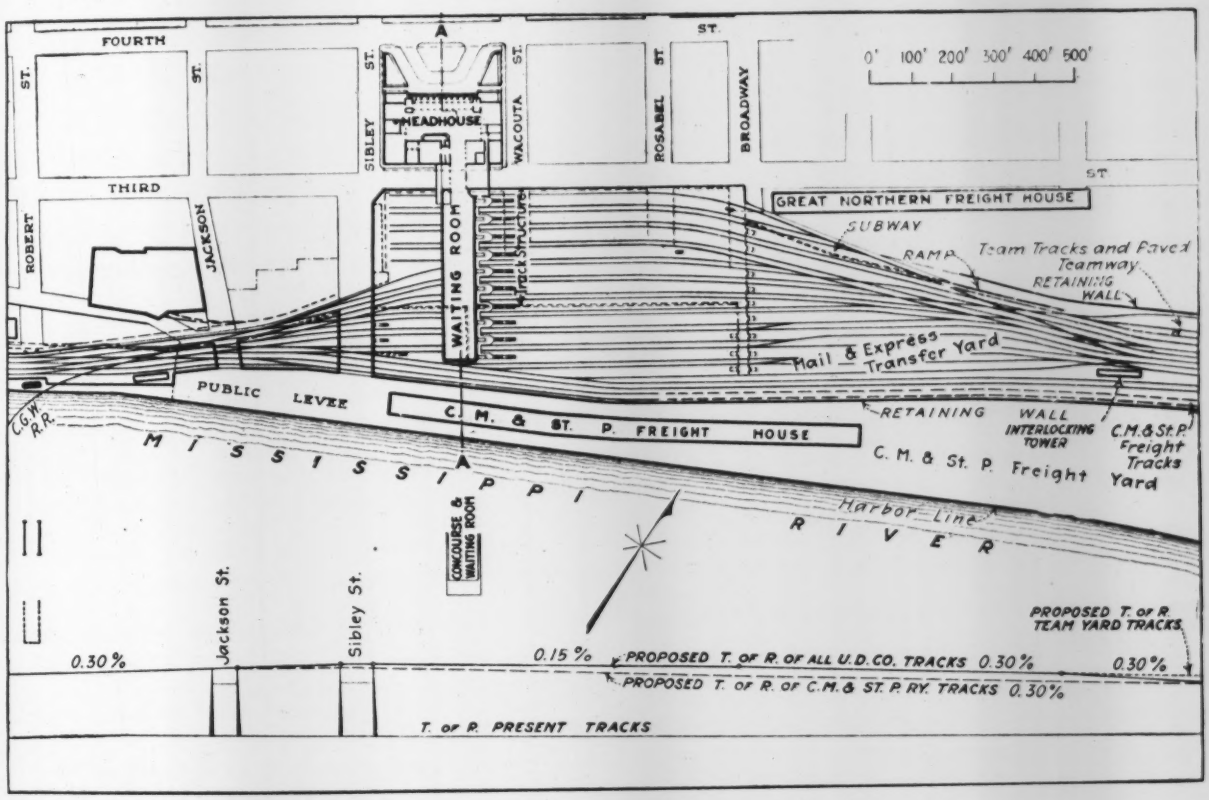
The south retaining wall to be built from Sibley St. west to the Chicago Great Western track leading to its bridge. Facilities to be provided for handling mail, baggage and express temporarily under the track structure. Six stub station tracks to be laid on the north half of the track structure and connected with the Great Northern tracks east of the station.

All traffic during the first two periods to be handled on the present tracks.

3. The old surface stub tracks to be abandoned and their traffic to be thrown upon the six new elevated stub tracks. The old headhouse to be wrecked and the south half of track structure over the baggage and express rooms to be built from Broadway to Sibley St. The concourse waiting room to be extended across the south half of the track structure, with elevators and stairways complete.



OLD LAYOUT



NEW LAYOUT

LAYOUT OF NEW $11,000,000 UNION STATION AT ST. PAUL WITH RELATION TO PRESENT TERMINAL

The building on the old station property west of Sibley St. to be wrecked. The north portion of the subways on Jackson St. and Sibley St. and the subway connecting them to be built; also the north retaining wall to Minnesota St. Fill to be placed along the north retaining wall to Minnesota St. for the first track and a temporary trestle to be built alongside for the second track. Fill to be placed from Broadway east for the throat tracks and for all approach tracks from the east.

Two additional stub tracks and four through tracks to be laid on the south half of the elevated structure, the latter connecting up with the two west approach tracks along the north retaining wall. The Robert St. bridge trusses to be changed.

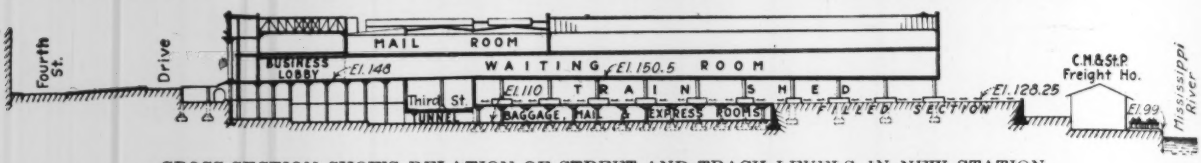
The Chicago, St. Paul, Minneapolis & Omaha and the Chicago, Milwaukee & St. Paul during this period to raise their joint approach tracks from the west to connect at Minnesota St. with the two tracks along the north retaining wall. The Chicago Great Western not to be connected up until the end of the fourth period.

4. Four surface through tracks to be abandoned, traffic being shifted to the elevated tracks. The concourse waiting room to be extended over four new elevated tracks, with elevator and stairway complete. A trucking subway and a baggage elevator to be built. Fill to be placed for the four new elevated station tracks and their throat connections from the east. A temporary trestle to be built for the Chicago Great Western to connect with the elevated tracks, and its bridge to be raised. Four new elevated through station tracks with approach connections to be laid.

5. All passenger traffic to be thrown upon the elevated station tracks, and all remaining surface tracks except those for freight transfer to be abandoned. The concourse waiting room and trucking subways to be completed, elevators and stairs to be installed. The Sibley St. and Jackson St. subways to be extended south, and fill placed for additional tracks. Two new elevated tracks to be laid for temporary use as freight transfer, these to be connected temporarily with the through freight tracks of the Chicago, Milwaukee & St. Paul.

6. Freight traffic to be thrown upon the new elevated tracks and the last of the surface tracks to be abandoned. The south retaining wall to be built from the Chicago Great Western tracks to Minnesota St. The Jackson St. and Sibley St. subways to be completed. The retaining walls for the Chicago, Milwaukee & St. Paul freight tracks east of Sibley St. to be built. All filling and trackwork to be completed.

7. The two interlocking towers to be built and the signal and interlocking system installed.



CROSS-SECTION SHOWS RELATION OF STREET AND TRACK LEVELS IN NEW STATION

It is estimated that if the work is started this season it can be completed by 1922. The total cost of the improvement is estimated at $11,000,000, of which $4,717,000 is for the additional land. The contract for the entire work was let jointly in 1917 to Morris, Shepard & Dougherty and the George T. Grant Construction Co. The planning and construction of the new station are under the direction of W. C. Armstrong, chief engineer of the St. Paul Union Station Company.

Canal Over Divide Raises Storage Service Factor

Concrete Lining Reduces Seepage—Riprap Checks Erosion—Cleaning Costs Twenty-Six Dollars Per Mile

WATER supply for the East Park reservoir of the Orland Irrigation Project of the U. S. Reclamation Service is insured by a feed canal connecting with Big Stony Creek, an adjoining watershed. The reservoir is on the drainage area of Little Stony Creek, but the run-off from this is insufficient in dry seasons. The reservoir has a capacity of 51,000 acre-feet and provides for the irrigation of 20,000 acres near Orland, California.

The canal is 7 miles long, with a maximum capacity of 250 sec.-ft. Its works include a diversion dam and head works, Salt Creek siphon and chute, a terminal chute, three storm-water culverts, five timber flumes for storm water, three farm crossings, and 4000 lin.ft. of concrete lining.

Nearly 80% of the excavation, amounting to 100,000 cu.yd., was included in 20% of the distance. The remaining 130,000 yd. was distributed over 80% of the distance and averaged 4 cu.yd. per lin.ft. Adobe clay, blue shale, cemented gravel and clay, loose boulder formation and solid rock were encountered.

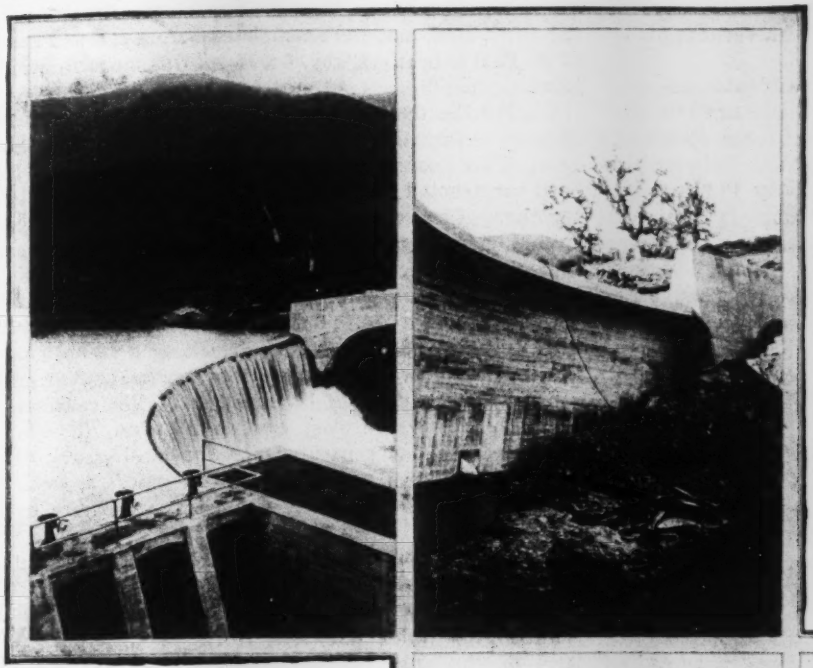
Adobe presented no special difficulty when dry, but was hard to handle when wet. The upper part of the shale was loose, and although the hardness increased with the depth, most of it was plowed with a No. 3 Western railway plow with eight horses. The cemented gravel and clay also caused trouble. Free use of black powder was found to be economical in loosening the cemented gravel and clay and the harder parts of the shale. The solid rock, similar to trap, was hard to drill and rather irregular in breaking.

Steam-shovel excavation with a ¾-yd. Marion-Osgood revolving machine was employed on some of the heavy work where the cut varied from a 6-ft. level section to a side-hill section 10 ft. deep on one side and 30 ft. on the other. There was considerable trouble in wasting the material, and some of it had to be moved four times. Excavated material was placed in the banks by short hauls, averaging about 75 ft. In the bottom of the heavy cuts which had to be taken out at the ends the haul was about 1000 feet.

About 184,000 cu.yd. were moved with four-horse fresno scrapers, 35,000 yd. by the steam shovel and 11,000 yd. by hand. The maximum force was 142 men and 153 head of stock; the average for 46 weeks was 52 men and 74 head of stock.

Concrete for the culverts and other structures was made with screened gravel of two grades. The fine aggregate included everything up to ¼-in. size not containing more than 10% by weight that would pass a No. 100 sieve. The coarse aggregate included everything over ¼ in. that would pass a 2-in. ring. The first plant had an 18-in. rotary screen 6 ft. long, with dust jacket the full length. It was driven by a 4-hp. gasoline engine and supplied bunkers of 9 yd. capacity. The material was scraped up to the elevator by two-horse fresnos, and dumped through a grizzly which excluded the pieces larger than 2 inches.

This large material made such a large proportion of the aggregate that it was decided to put in a crusher and another screening plant. This consisted of a Fort



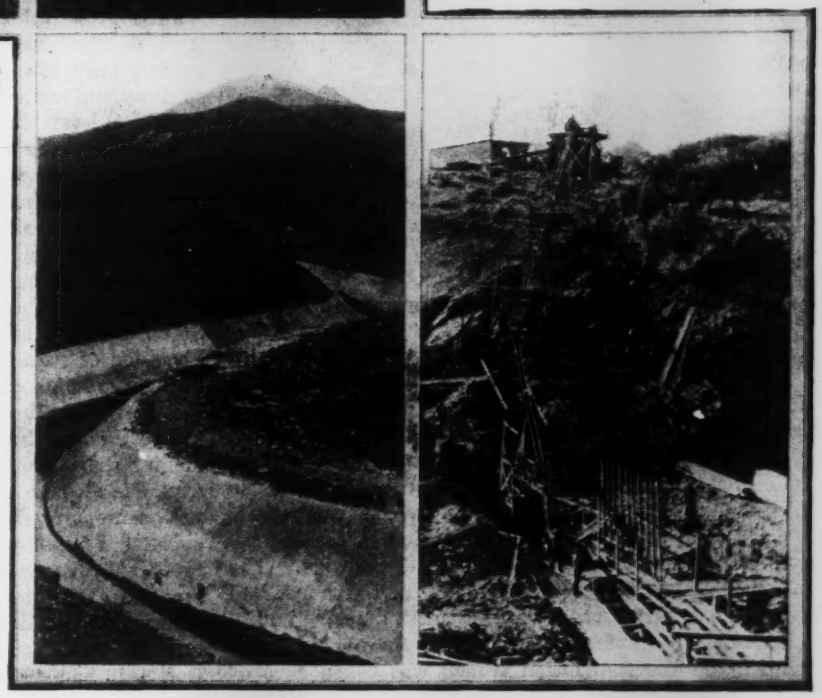
ARCHED DIVERSION DAM AND CANAL HEADWORKS—DOWNSTREAM FACE SHOWS PROJECTING CREST

Wayne jaw crusher with 24-in. rotary screen 6 ft. long (with dust jacket), a 25-hp. gasoline engine and 30-yd. bunkers. All the material was delivered to the structure sites by dump-body motor trucks; one 5-ton and two 3-ton Pope-Hartfords, and two 5-ton Packards. The smaller ones hauled 3 yd. and larger ones 4½ yd. The average haul was three miles.

For 4000 ft. below the head gates the canal lies along the creek bank and is lined with concrete to prevent seepage losses and possible washouts. The bottom width is 5 ft.; depth, 6 ft.; side slopes, 1.1; grade, 0.125%. The lining is 4 in. thick, and has expansion joints 16 ft. apart. In construction the excavation was made 6 ft. wide. The final trimming was done with the aid of templets. Sand and gravel suitable for this concrete were found in the creek bed at several points adjacent to the portion to be lined. A gravity screening plant was set up on the canal bank and a runway excavated, part of which was on a grade of about 8%. On this a track was laid for 1-yd. Koppel dump cars, which were loaded by two-horse fresno scrapers through a trap.

A team pulled the loaded car up to the steep grade, where a cable was made fast to it. Four horses traveling on the canal bank raised it the remainder of the way, the cable running through two single blocks used as guides. As there was not much storage room, the gravel was stored in the canal and the sand on the bank. Four different sets-ups were made.

The 1:3:6 mix first used was so hard to finish that it was gradually changed until it was 1:4:5, which proved very satisfactory. The concrete was distributed by means of a Koppel car on a portable track and was placed without forms. Only one car could be used, as there was not room for two tracks. All mixing was done by hand on a board at such a height that the concrete could be scraped into the car. The lining was placed for approximately 500 ft. each way from each gravel pile. The maximum record was 65 cu.yd. placed in one 8-hour day. This was done with four men



CANAL FOLLOWS CONTOURS—CONCRETE WAS CHUTED TO HOPPERS FOR DISTRIBUTION BY BUGGIES

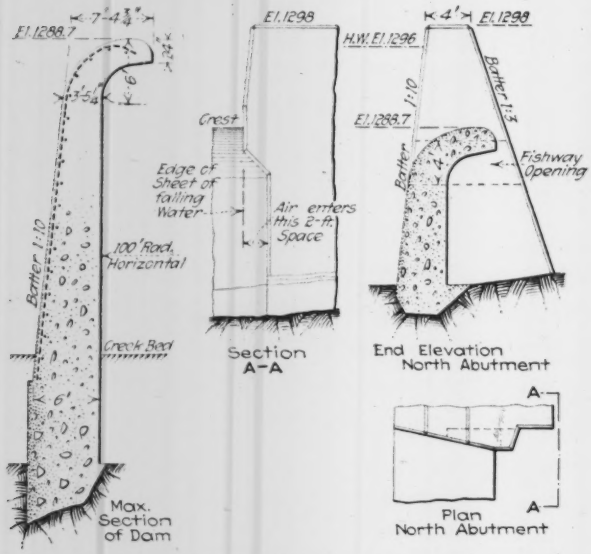
hauling sand and gravel, one man handling water, one handling cement, 10 mixing, two on the car, four placing and three finishing.

This unit comprises the dam, upper and lower control gates, overflow spillway, spihon spillway and fishway. The dam is of the pure arch type, of 100-ft. radius, with a crest length of 154.57 ft. The north abutment is of gravity type and the south abutment of U type. The spillway section has a curved projecting crest. At its ends the abutments are extended about two ft. so that the crest is shorter than the lower part

of the dam. This arrangement gives an air space at each end and prevents the formation of a vacuum under the sheet of falling water.

Automatic control of the flow of water into the canal is provided by gates and spillway. There are two sets of three openings 4 x 5 ft.; the upper ones closed by gates and the bottom ones by stop-planks. Between the two sets of gates is an overflow spillway 178 ft. long, and a siphon spillway. This siphon is designed to carry 100 sec.-ft. and to begin working when there is a head of 0.2 ft. on this spillway.

The fishway consists of a series of pockets, 5 ft. wide and 6 ft. long, with a minimum depth of 2 ft.,



DETAILS OF DIVERSION DAM WITH OVERHANGING CREST

each having an overflow weir with a drop of 16 in. It passes through the north abutment, above which are three pockets for flashboards which control the flow down the fishway during floods.

Excavation was begun at the abutments. When the section across the channel was reached the flow of the creek had dropped to 40 sec.-ft., which was easily diverted by a sand-bag dam and carried across the excavation in a flume 3 ft. deep and 4 ft. wide. The leakage through this dam was small and was handled by a 2-in. rotary pump working continuously, and a 4-in. centrifugal pump working about four hours daily. A spring in the foundation trench was taken care of by concreting a pipe in the crevice and carrying it out through the forms.

Materials encountered in the creek bed were sand and boulders, with a maximum depth of 13 ft., overlying a hard blue rock, into which the trench was carried at least 4 ft. The material at both abutments was disintegrated igneous rock, but a stratum of micaceous schist made it necessary to move the south abutment 10 ft. upstream. The spillway was located in solid rock of the same nature as the foundation of the dam.

The concrete in the arch section was placed in alternate blocks until it reached an elevation of 4 ft. above the top of the flume. Above that, each day's run was placed in a ring from abutment to abutment. It was raised to El. 1273 and then the upper control gates and the north abutment were completed before it was raised to its final height. A key, 6 x 12 in. was made in every joint.

Closing the flume opening in the dam was left until 21 days before the placing of the last concrete in the arch. This closure was made with an 8-in. timber bulkhead constructed of 4 x 12-in. Oregon pine sticks bolted together. Concrete guides had been made on the upstream side of the opening, and a 4 x 8-in. pine sill concreted in place gave a bearing surface 6 in. wide. No trouble was experienced in placing the bulkhead.

Concrete was a 1 : 2½ : 6 mix, made in two-sack batches in a Koehring 20-cu.ft. mixer, driven by a 12-hp. gasoline engine. It was discharged into a metal chute which ran down to the level of the creek bed. The continuity of this chute was broken by two hoppers. The first was on the bench excavated for the head gates; this held three batches and had a control gate. A smaller hopper about 15 ft. lower stopped the concrete only momentarily.

Part of the work was poured direct from the chute. For the remainder, the concrete was caught in the large hopper and distributed in buggies to chutes of jointed pipe which delivered it in place. Above the level of the creek the concrete was poured from a runway built at the elevation of the crest. The fishway, spillway, siphon and lower control gates were all poured from this level.

After the new work was primed and started with a small head of water, the discharge of the canal was gradually increased to its capacity of 250 sec.-ft. During 1915-16 less than 2000 acre-feet were diverted into the reservoir by the feed canal, the natural flow of Little Stony Creek being ample to fill the reservoir. The season of 1916-17 was dry as far as run-off from the Little Stony drainage area was concerned, and the results of diversion of storage water from the Big Stony justified the construction of the canal.

Records for that season show that on June 1, 1916, at the time of draft on storage for irrigating requirements, there would have been only 36,273 acre-feet available storage at the reservoir if the feed canal had not been operated. The entire storage would have been depleted by September, with serious loss of crops and fruit. With the diversion of 21,000 acre-feet storage from the Big Stony watershed through the canal, the reservoir was filled to its capacity of 51,000 acre-feet on June 1, and at the close of the irrigation season on Oct. 1 it had 4000 acre-feet of storage for irrigating citrus orchards during October and November.

The gradient is mainly 0.1% and the velocity in the earth sections varies from 3.65 to 3.85 ft. per sec. No erosion due to velocity of water has occurred on the tangents, and only a moderate amount has occurred on the outside of curves. This has been checked by riprapping the bank with large cobblestones available in the near vicinity.

The cost of maintenance of the canal has been nominal, due to the limited periods of operation. Cleaning consisted mostly of the removal of eroded material, which is done with four-horse fresno scrapers. There has been no trouble from weed growth, as the canal is operated only in the winter season, when plant growth

is dormant. The cost to date has been $26 per mile for cleaning and $11 per mile for protection against erosion. This includes work done for the season of 1917-18. No difficulties have been encountered in the operation of the various structures on the canal.

A. N. Burch is project manager of the Orland Project; M. E. Ready was assistant engineer in charge of location and construction. P. S. Schuyler, of Oakland, Calif., had the contract for earthwork, and M. Fisher, of San Francisco, the contract for the structures.

Segmental Roller Bearings for Concrete Girders

Michigan State Highway Department Makes Provision for Expansion at Piers on Bridges of Multiple Span

By C. V. Dewart

Bridge Engineer, Michigan State Highway Department, Lansing

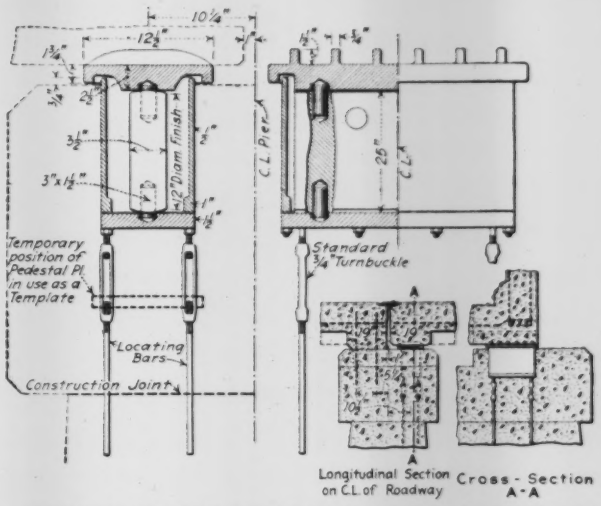
TO TAKE care of the expansion over the piers of reinforced-concrete girder bridges, the Michigan State Highway Department has adopted as standard the geared segmental roller bearing which is shown in detail in the accompanying drawing. Such a bearing is common in steel structures but is somewhat novel for the ordinary highway concrete bridge. For one or two span concrete girders ordinary tar-paper joints are acceptable, but in spans above that some further provision for movement is desirable if not necessary.

The bearing consists of a lower hollow casting resting on adjustable supports and containing in a medium of heavy oil the segmental rollers which fit into the girder shoe. The shoe is held in the girder with lugs parallel to the span length.

No parts of this roller are exposed to the weather except molded surfaces of the castings, which makes it practically as permanent as the concrete itself. The girder shoe is tapped with a ¾-in. pipe plug, by means of which the depth of oil in the lower casting may be inspected and more added when necessary. A heavy oil should be used in order to reduce evaporation.

The girders are placed with a 2-in. open joint over the pier and end floor-beams, with one roller under the expansion end of each girder. Thus there may be two or four rollers on a pier. The open joint between floor-beams is taken care of by the usual expansion plate. This expansion plate runs up the curb to the web of the girder and prevents the road metal as well as dirt from the roadway from falling into and clogging the open expansion space. This plate receives a liberal application of tar before the road metal is placed.

The pier is first poured up to the under side of coping and in this run of concrete it is necessary to place the locating bars. In placing these bars the pedestal plate may be used as a templet. The pedestal plate may then be removed by turning the locating bars in the concrete. The turnbuckles are then placed on the locating bars and the pedestal castings on top of the turnbuckles. By means of the turnbuckles the castings are leveled up to exact final elevation. Any side movement of castings may be taken care of by horizontal wooden spacers bracing the castings temporarily against the inside of the forms. Held in this manner it is easy to tamp concrete thoroughly under the pedestal plate without knocking the plate out of position. The coping of pier may then be poured complete. A 9-in. depression is left in the top of the pier between pedestals from which to remove the bulkhead between the floor-beams. All bulkheads for the girders outside of this depression in the pier are of horizontal boards and removed from the outside of the girder. These bulkheads are held in place by light strips having greater depth than breadth, making it possible to reach in from the outside with a bar and split the strips, thereby loosening the form boards. All form boards in the bulkheads should be separated from the concrete and also from the supporting strips by felt paper, which will facilitate removal.



SEGMENTAL ROLLER BEARING IN HEAVY OIL PROVIDES FOR EXPANSION ON CONCRETE GIRDER BRIDGES

Altoona Makes Pork of Garbage, Instead of Fire

Garbage incinerators, new and old, continue to be shut down, to save money and conserve food to meet war conditions. Altoona, Pa., affords a recent example. Before the commission-manager plan went into effect a 50-ton garbage incinerator was built at a cost of $60,000. Garbage only was burned, requiring coal as well as labor, the operation cost being some $2500 a year. In addition, the garbage had to be hauled an average distance of four miles from the city to the incinerator at a cost of $6000 a year, making a total yearly cost of $8500, with no allowances for capital charges. After H. G. Hinkle, formerly city engineer, took office as city manager early in the present year he worked up a plan for municipal collection of garbage, with disposal to owners of hog farms located three miles beyond the city limits. The contract runs from May 1, 1917, to Dec. 31, 1919. The city collects the garbage and turns the loaded wagons over to the contractor at the city yard. The contractor is obliged to cleanse the wagons before returning them to the city. The contract contains no provision for maintaining the hog farm in a sanitary condition. The contractor does not pay for the garbage, but the city will save the cost of hauling to the incinerator and of coal and labor to burn the garbage, while the contractor will turn the garbage into pork to help win the war.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

New Edition of "Railroad Engineering"

REVIEWED BY M. P. PARET

Lake Charles, La.; Late Valuation Engineer, Interstate Commerce Commission

THE ELEMENTS OF RAILROAD ENGINEERING—By William G. Raymond, C. E., L.L.D., M. Am. Soc. C. E., Member American Railway Engineering Association, Professor of Civil Enginering and Dean of the College of Applied Science, The State University of Iowa. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Cloth; 6 x 9 in.; pp. 447; illustrated. $4.

Successive editions of Professor Raymond's "Railroad Engineering" have been designed as textbooks for use in engineering schools. In the present edition the introductory chapter and the chapter on valuation have been expanded to meet present conditions.

The "Introduction" lays clearly and comprehensively before the student his need for a thorough understanding of the nature and objects of a railroad and how those objects are to be attained. This preview is striking evidence of the author's thorough knowledge of his subject. Two statements in the "Introduction" need qualification. The first, that "railroads in America are built for the single avowed purpose of making money for the projectors," seems too broad for literal adoption. If the word "investors" had been used instead of "projectors," or if the sentence had ended with the word "money" the assertion would have been the truth. The remark that title to railroad property acquired by deed is not limited as in the case of such property acquired by condemnation is apt to be misleading to a student. There are various kinds of deeds. Right-of-way deeds are generally little more than easements, and railroad charters are not perpetual.

The reviewer was particularly interested in the chapter on valuation. After having had several years of interesting experience in that line of work and after having read much of what has been written on the subject, he feels that in this treatise the student has the subject of valuation presented to him in a well condensed, clear and generally excellent manner. Valuation is but the determination of value, but there are so many and varied kinds, classes and descriptions of value, that the purpose of valuation seems to be lost in a labyrinth of personal opinion; or, like so much in the law, based more on precedent than equity. After all, as the author defines "normal value" the old saw, "What's the worth of anything, but so much money as 'twill bring," is not so far astray. The author confines himself to the theory of valuation and does not attempt to coach the student in the practice. A few pages outlining the methods used in practice by the Interstate Commerce Commission and by some of the carriers would no doubt have been both interesting and instructive to the student.

The chapter on betterment surveys is timely. As a rule, textbooks do not give sufficient attention to this class of work. The arrangement of chapters might have been more logical. Why not treat the study of a railroad in the natural sequence in which it would be built?

The appendix serves the student as an excellent example of instruction in practical modern railroad location, pertinently discussed by experts.

The student is to be congratulated upon having at his disposal a most excellent and practical treatise on railroad engineering, and also upon the fact that the diagrams and cuts are clear and legible and the typography is excellent.

Tanks and Reservoirs for Storing Oil

OIL-STORAGE TANKS AND RESERVOIRS: With a Brief Discussion of Losses of Oil in Storage and Methods of Prevention. By C. P. Bowie. Washington, D. C.: Limited free edition; 25c. from Superintendent of Public Documents. Paper; 6 x 9 in.; pp. 73; illustrated.

Scarcity of printed information concerning oil tanks and reservoirs and the admirable way in which the subject is presented make this monograph doubly welcome. Detailed plans and specifications for "gas-tight" steel tanks of 55,000-bbl. capacity and for wood-roofed concrete-lined earth reservoirs of 750,000-bbl. capacity are presented (42-gal. bbl. in each case). Various details of each kind of tank are discussed in the text, and there is a section on wooden roofs for steel tanks. A few cost figures are given. Leakage from tanks and reservoirs is discussed briefly, and attention is given to the subject of evaporation. Relatively small tanks for the storage of fuel oil by consumers are considered. There is a section on the computation of the volume of tanks and reservoirs and the preparation of gage tables. Painting is taken up. There is a good index.

Model Condensed War-Time Report

CHEMICAL AND BACTERIOLOGICAL EXAMINATION OF THE LONDON WATERS: Report by Dr. A. C. Houston, Director of Water Examination, Metropolitan Water Board for the year ending Mar. 31, 1918. London: P. S. King & Son. Paper; 8½ x 12½ in.; pp. 23; 6 diagrams and 224 microphotographs. 5 shillings.

Seldom is so much valuable information given in small compass as has been presented in the past two or three years in Dr. Houston's reports on the quality of the water-supply of London, England. To economize paper to meet war conditions recent reports were cut in length from 61 to 40 foolscap pages, and then a year ago to 16 pages. It is gratifying to see that Dr. Houston has given himself a little more latitude in the present report.

Last year Dr. Houston aptly stated in his report, "It should be remembered that 'paper' sometimes imparts knowledge, and knowledge not infrequently leads to economy." He enlarges interestingly upon this idea in the present report. Thus he says: "It is a serious matter to withhold knowledge which is, or may be, economically advantageous, and it is most undesirable to carry out radical and debatable alterations in old established water-works procedure, without a frank and responsible statement of the apparent necessity or desirability of such changes."

This report, like its immediate predecessors, is con-

fined largely to the presentation and interpretation of data on changes of procedure at the London water-works and on other matters bearing upon the more economical operation of the works, made imperative by war conditions. Noteworthy among the changes of procedure have been the use last year and again this year of chlorination as a substitute for storage to improve the quality of the supply, this substitution resulting in a marked saving of coal used to pump water for storage to improve the bacterial quality of the supply. Another important line of study covered in the report has to do with the resistance of the water filters under various conditions.

A remarkable feature of the report is the presentation on a half-dozen pages of no less than 224 microphotographs and the description of these halftones in about a page and a half of text. A few of these figures show suspended matter in the water, but most of them are exhibits of the microörganisms present under various conditions.

Altogether, the report is a model of highly compressed review of a year's scientific work. It contains more useful information and suggestions than many municipal reports that run to hundreds of pages. From this point of view alone it deserves wide study.

Quality and Use of Lubricants

REVIEWED BY JOHN J. FLATHER

Professor of Mechanical Engineering, University of Minnesota, Minneapolis

AMERICAN LUBRICANTS: From the Standpoint of the Consumer—By L. B. Lockhart, Consulting and Analytical Chemist. Easton, Pa.: The Chemical Publishing Co. Cloth; 6 x 9 in.; pp. 236; illustrated. $2.

Buyers and users of lubricants will find this book valuable. Production is not neglected, but the point of view throughout is essentially that of the man who desires information on the quality and use of lubricants.

The contents of the volume may be roughly grouped as follows (1) Production, refining and characteristics of oil, 20 pp.; (2) friction and lubrication, 78; (3) physical and chemical testing of oils, 28; (4) lubricating greases, 12; (5) animal and vegetable oils, 16; (6) specifications, 46; (7) gasolines and kerosenes, 10 pages.

The author follows Ubbelohde in assuming that in well lubricated machinery, under definite conditions of speed and pressure, the coefficient of friction is solely dependent upon the viscosity of the oil. Therefore, the problem of the user of lubricants is to obtain an oil which will have just the right viscosity under the given conditions of speed, pressure and resulting temperature, or, as in high-speed machinery, under the working temperatures of the oil film. Which oils and greases to select under the varying conditions of practice, and how to test these oils, are very fully presented under the different classes of machinery which are discussed. These include automobiles and airplanes, electrical machinery of all sorts, steam engines and turbines, locomotives and railway cars, cotton and textile machinery, and miscellaneous machinery such as found in flour mills, rolling mills, compressed air and refrigerating plants, and in mines and quarries.

A feature of the work of particular value to the engineer and works manager as well as to the purchasing agent is the large number of quotations from existing specifications, prepared by representative users of lubricants, such as the United States Navy and War Departments, and many important railroads. From the pages, nearly 50 in number, devoted to this phase of the subject one can obtain a concise, well tried specification covering any set of conditions.

The use of graphite as a free lubricant, and also when mixed with grease, is discussed at some length, and copious references are given to tests of the effect of graphite on the coefficient of friction of lubricants.

A commendable feature of the work is the exclusion of a mass of irrelevant material often found in books of this sort, intended for the guidance of the user, but which tend rather to obscure the essential facts than to give additional light. The extensive references quoted through the text afford ready opportunity for further investigation, if there be need. The book is well worth a place in the library of the engineer and chemist, and can be recommended to the user of American lubricants.

What Shall We Do With Our Railways?

REGULATION OF RAILWAYS: Including a Discussion of Government Ownership Versus Government Control—By Samuel O. Dunn, Editor of The Railway Age; Author of "The American Transportation Question." New York: D. Appleton and Co. Cloth; 5 x 8 in.; pp. 333. $1.75.

Nobody who is familiar with the *Railway Age* will be surprised to learn that its editor regards proper Government regulation rather than Government ownership as the solution of the railroad problem. Regulation, he thinks, has already eliminated some of the worst of railroad evils, and has made virtually impossible the exploiting of the public. What he finds more needed now is protection of the railroad industry. In his book he tells how he would accomplish this by centralizing regulation, making the work of the regulating board more attractive to men of ability, and then giving it more power.

"What is the matter with regulation?" is the question the author puts himself in the chapter following his introduction. He enumerates nine faults—mostly arising from lack of clarity and uniformity as to policy. There is interference, he says, between national and State commissions and between commissions and lawmaking bodies, as well as usurpation by the regulatory bodies of managerial functions. In his next three chapters he develops his view that the Government should not usurp managerial functions, that commission regulation is far superior to legislative regulation and that Federal control is equally superior to State control.

Regulation of rates is the subject of a chapter. The author finds that the main trouble here is that regulation downward has been considered the only kind of regulation, and that the power of the commissions has been shaped accordingly. He would make it as easy for commissions to establish minimum as maximum rates.

A chapter is given to valuation, one to regulation of securities and one to regulation of railway operation. The author feels that if there is to be extensive regulation of operation, experienced operating men should be appointed to the commission and the commission should have a subordinate board of technical experts.

In a chapter, "Peaceful Settlement of Labor Dis-

putes," the author points to the unsatisfactory experiences of the past, and asserts that the time has arrived for a change in our methods of dealing with disputes. He discusses also the strong and weak points of plans that have been tried in other countries, as well as those that have been proposed in this country.

Six chapters are devoted to a comparison of regulation and Government ownership. The author points to the vicissitudes of the Government railroads in Canada and presents many good arguments against Government ownership.

The author sums up in two chapters of conclusions. In the first he gives eight ways in which our present policy of regulation needs to be changed. In the second he discusses the possibilities of regional railroad companies and sets forth four desirable elements in a regional plan. He believes such a plan "would have many advantages and few disadvantages as compared either with the present system of private ownership and management or with Government ownership and management."

Domestic Engineering

MECHANICS OF THE HOUSEHOLD: A Course of Study Devoted to Domestic Machinery and Household Mechanical Appliances—By E. S. Keene, Dean of Mechanic Arts, North Dakota Agricultural College. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 383; illustrated. $2.50.

Current practice in heating, plumbing, water-supply, sewage disposal, ventilation, lighting by various means and electric service of all kinds is described, generally in much detail. There are separate chapters on coal and on gaseous and liquid fuels. Every conceivable appliance, within reasonable limits, from steam heating plants to electric toasters, is described and its uses are explained. The chapter on sewage disposal contains some misleading statements and seems to be the weakest of the volume. Under water-supply "devining rod" for "divining rod" appears six times in a half page designed to serve as a warning against being duped by water finders.

Municipal Utility Bibliography

A BIBLIOGRAPHY OF MUNICIPAL UTILITY REGULATION AND MUNICIPAL OWNERSHIP—By Don Lorenzo Stevens, M. B. A. Cambridge, Mass.: Harvard University Press. Cloth; 6 x 9 in.; pp. 378. $4.

Comprehensive, well arranged and of handsome typographical appearance, this annotated bibliography promises to be eminently useful. The compiler states in his preface that the work is "intended primarily for the use of business men," but that in order to serve the "expert and the general reader alike" he has included "all readily accessible books and signed articles, of more than transitory interest." Only "especially valuable" official publications and the best of material published earlier than within the decade that ended with 1916 are included, and there are no references to material printed in other than the English language.

The main classification is under these heads: General works, history of utilities and regulation, franchises, public-service commissions, valuation, rates, taxation, holding companies and municipal ownership. The entries are by authors only, and the very complete index is also wholly by authors. A subject index might have saved a large total of time to users of the bibliography. Subclassifications under the nine main heads already named partly make up for the lack of a subject index, but most of the subclassification is by states and countries.

It is a pleasure to note that the author is preparing a book on "The Regulation of Municipal Utilities."

Addressed to Laymen

THE FIGHTING ENGINEERS: The Minute Men of Our Industrial Army—By Francis A. Collins, Author of "The Air Man," "The Camera Man." New York: The Century Co. Cloth; 5 x 8 in.; pp. 200; illustrated. $1.30.

Impressionistic in the extreme, sketchy to the point of carelessness and popularized to an extent not even found in modern war correspondence, this hasty effort to tell what the American engineers are doing today in France is apt to arouse the resentment of the engineer-reader until he realizes that it is addressed to the layman. For such a purpose it has its value. It will, no doubt, elevate the engineering profession in the minds of its readers, for in spite of some exaggeration and many ridiculous errors, it does set forth fairly the manifold activities of our civilian engineers suddenly impressed into the great conflict. Details are generally lacking, but that is not necessarily the fault of the author. It is a fact that few on this side of the Atlantic, even in the inner circles of the War Department itself, are acquainted with sufficient detail of the engineering operations in France to write a complete story of them today. Mr. Collins has conveyed a general impression of the wonderful work of the engineering profession in war. To get details in such a book would be too much to expect.

Six Years of State Budget Reform

Attempts to increase the efficiency and economy of our State governments have centered in the past few years in schemes for substituting systematic budget procedure, initiated by the executive head of the State, for the haphazard system of drafting mere appropriation bills without regard to revenue, and that by the legislature, often acting through a number of uncoordinated appropriation committees. The belated number of *Municipal Research* for November, 1917 (New York Bureau of Municipal Research; $1), is devoted to a study of the question by Fred Wilbur Powell. It is entitled "The Recent Movement for State Budget Reform: 1911-1917." After a brief general review, the author first classifies under such heads as "Legislative Committee," "Governor," etc., the various States which have recently proposed or adopted new plans of budgetary procedure. He then reviews the various budget schemes of a large number of States. General considerations and a brief bibliography conclude the pamphlet. The subject is one which should appeal to all engineers in the public service, as well as public spirited citizens generally, since American weakness in budget procedure is constantly hampering engineers and cutting down the efficiency of Federal, State and municipal governments.

New Engineering Society Journal

Beginning in May, the first number of the *Journal* of The Engineering Institute of Canada makes its appearance, with 66 pages of 9 x 12-in. size, not including advertising pages. The Institute succeeds the long estab-

lished Canadian Society of Civil Engineers. The initial number of the *Journal* is nearly filled with the proceedings of the first general professional meeting of the organization under its new name. The meeting was devoted to the discussion of fuel conservation in its many phases. Reports from branches are also included. Future issues will contain advance printings of papers to be presented at general meetings. Papers read before branches will be published in the *Journal*, in advance when practicable. Correspondence, personals and a review of current engineering literature will also be printed. Fraser S. Keith is editor and manager (176 Mansfield St., Montreal, P. Q.). He is assisted by ten associate editors.

Fertilizing Value of Activated Sludge

Comparative studies of the fertilizing value of activated sludge and barnyard manure, begun in 1915 at the main sewage-works of Toronto, Ont., are reported by George G. Nasmith and G. P. McKay in a reprint from the *Journal of Industrial and Engineering Chemistry* for May. (Address the authors at the Public Health Laboratories, City of Toronto, Ont.) The conclusions drawn are that "activated sludge is a most valuable fertilizer," its use showing materially increased yields over the use of equal weight per acre of "standard barnyard manure."

Modern Building Code for Hartford

The preparation of a modern building code for Hartford by a council committee working with consulting engineers gives another opportunity to secure a compilation of ideas as to how building conditions in a growing, semi-industrial and semi-residential city ought to be treated. The chapters on steel construction and reinforced concrete in the new code appear to be drawn with special care, which fact probably had some connection with the absence of any mention of these subjects in the law hitherto in force. For copies of the code address, Ford, Buck & Sheldon, consulting engineers, Hartford, Conn.

Industrial Housing and Town Planning

Morgan Park, a residence section of Duluth, Minn., built, owned and operated by a subsidiary of the United States Steel Corporation, is described in a 24-page illustrated reprint from the April *Monthly Review* of the United States Bureau of Labor Statistics (Washington, D. C.). It deals with both town planning and housing, chiefly the latter. Temporary housing for construction forces, and permanent houses of concrete and of stucco for all classes of wage and salary earners, are described in some detail, with cost and rental figures.

Water Filtration News

The latest claimant for attention in the growing field of industrial house organs is *Shop and Field News*, the first number of which is dated June. It gives a variety of interesting information designed primarily for the employees of the Pittsburgh Filter Manufacturing Co. (622 Farmers' Bank Building, Pittsburgh, Penn.; 10c. a number).

PUBLICATIONS RECEIVED

[So far as possible the name of each publisher of books or pamphlets listed in these columns is given in each entry. If the book or pamphlet is for sale and the price is known by the editor the price is stated in each entry. Where no price is given it does not necessarily follow that the book or pamphlet can be obtained without cost. Many, but not all, of the pamphlets, however, can be secured without cost, at least by inclosing postage. Persons who are in doubt as to the means to be pursued to obtain copies of the publications listed in these columns should apply for information to the stated publisher, or in case of books or papers privately printed, then to the author or other persons indicated.]

BIBLIOGRAPHY OF PETROLEUM AND ALLIED SUBSTANCES, 1915—By E. H. Burroughs. Washington, D. C.: Bureau of Mines. Paper; 6 x 9 in.; pp. 126.

BOARD OF STATE ENGINEERS OF LOUISIANA: Report from April, 1916, to April, 1918. New Orleans, La.: The Board. Paper; 6 x 9 in.; pp. 147.

CITY PLANNING FOR DAVENPORT, IOWA: Report to the Mayor and City Council—By Roscoe E. Sawistowsky, City Engineer. Davenport, Iowa: City Clerk. Paper; 6 x 9 in.; pp. 81; illustrated. 75c.

Acting under a city ordinance directing him to prepare a "comprehensive plan" for Davenport and to make recommendations for controlling future platting of land, size of lots, percentage of area built on and zoning, the city engineer of Davenport has reviewed some of the elements of city planning, proposed a "general city plan for the improvement and extension of the city" and submitted drafts of state legislation on building lines, residence districts and city planning commissions, as well as a constitutional amendment authorizing excess condemnation in Iowa.

ELIMINATION OF SEWAGE FROM TOLEDO'S WATERWAYS: With Data Covering Ten-Mile Creek. Toledo, Ohio: Commission of Publicity and Efficiency. Paper; 6 x 9 in.; pp. 73; illustrated.

Report on data and design of sewage collection and treatment works by Watson G. Harmon, special sanitary engineer, made to H. C. McClure, commissioner of engineering and construction.

FUEL BRIQUETTING IN 1917—By C. E. Lesher. Washington, D. C.: United States Geological Survey. Paper; 6 x 9 in.; pp. 3; illustrated.

GOLD AND SILVER IN 1916—By A. D. McCaskey and J. P. Dunlap. Washington, D. C.: U. S. Geological Survey. Paper; 6 x 9 in.; pp. 45; illustrated.

LUMBER, LATH AND SHINGLES IN 1916, PRODUCTION OF—By Franklin H. Smith and Albert H. Pierson, Statisticians in Forest Products. Washington, D. C.: U. S. Forest Service. Paper; 6 x 9 in.; pp. 43. 5c. from Superintendent of Public Documents.

MINING ENGINEERS' HANDBOOK—Written by a Staff of Specialists Under the Editorship of Robert Peele, Professor of Mining Engineering in the School of Mines, Columbia University. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Flexible leather; 4 x 7 in.; pp. 2307; illustrated. $5.

A NEW MISSISSIPPI RIVER: Being a Project for a Ship and Drainage Canal and Canalized River from Cairo, Illinois, to Bayou Sara, Louisiana—By T. W. Brown. Memphis, Tenn.: The Author. Paper; 6 x 9 in.; pp. 55; illustrated. 50c.

THE OPERATION OF SEWAGE TREATMENT PLANTS IN IOWA—By J. H. Dunlap, Associate Professor of Hydraulics and Sanitary Engineering, State University of Iowa. Iowa City: The Author. Paper; 5 x 8 in.; pp. 18; illustrated.

PUBLIC SERVICE COMMISSION, SECOND DISTRICT, NEW YORK STATE: Report for 1917. Albany: The Commission. Cloth; 6 x 9 in.; pp. 909.

THE ROCKEFELLER FOUNDATION: A Review of its War Work, Public Health Activities, and Medical Education Projects in 1917—By George E. Vincent, President of the Foundation. New York: The Foundation. Paper; 6 x 9 in.; pp. 48; illustrated.

A SANITARY SURVEY OF CHARLESTON, WEST VIRGINIA—Mayo Tolman, Director and Chief Engineer, Division of Sanitary Engineering, West Virginia State Department of Health. Charleston, W. Va.: The Department. Paper; 6 x 9 in.; pp. 168; illustrated.

STATISTICS OF RAILWAYS IN THE UNITED STATES: Annual Report for 1915. Prepared by the Division of Statistics. Washington, D. C.: Superintendent of Documents. Cloth; 9 x 12 in.; pp. 1181. $1.50.

Blame for the long delay in making these 1914-15 statistics available should be placed largely on the Government Printing Office, it appears, since the report was transmitted to the Interstate Commerce Commission by Statistician Meyers on June 23, 1916. Presumably the office named can shift the blame, in turn. Unfortunately, no end of blame shifting can make up the loss that comes from the long delays in presenting so large a part of our Government statistics.

THE STORAGE OF BITUMINOUS COAL—By H. H. Stoek, Professor of Mining Engineering. Urbana, Ill.: Engineering Experiment Station, University of Illinois. Paper; 6 x 9 in.; pp. 187; illustrated. 40c.

THE STRUCTURAL AND ORNAMENTAL STONES OF MINNESOTA—By Oliver Bowles. Prepared in Coöperation with the Minnesota State Geological Survey. W. H. Emmons, Director. Washington, D. C.: U. S. Geological Survey. Paper; 6 x 9 in.; pp. 218; illustrated.

A STUDY OF THE HEAT TRANSMISSION OF BUILDING MATERIALS—By A. C. Willard, Professor of Heating and Ventilation, and L. C. Lichty, Research Fellow, Engineering Experiment Station. Urbana, Ill.: The University of Illinois. Paper; 6 x 9 in.; pp. 60; illustrated. 25c.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Industry Must Be Strengthened Now and After War

Sir—Upon behalf of the Highway Industries Association I desire to express our thorough appreciation of your timely and appropriate suggestion for the appointment of a committee to deal with industrial conditions of our country after the war.

The highway industries of the United States represent more than $2,000,000,000 of invested capital and more than one million wage earners, and are therefore vitally interested. They are not only interested in preparedness for after the war, but believe the first essential in preparedness is protecting what we already have.

In our loyalty and determination to win the war we must realize that industry is to do its part.

Without industry an army, regardless of size, would be helpless and useless. If men are to fight they must be equipped and fed; therefore, wherever possible we must remove all handicap so that industry may not be disturbed unnecessarily.

If capital and labor are to furnish the finances for war we cannot destroy or weaken their institutions.

Let our various commissions and agencies realize a duty to ascertain definitely the result of their deliberations and actions upon all industry rather than simply gain their own individual ends.

S. M. WILLIAMS,
President Highway Industries Association.
Washington, D. C.

Military Drill for College Students

Sir—After reading the editorial in your issue of May 30 entitled "Military Drill for College Students," I wrote to Secretary Baker in relation to this matter. I am inclosing herewith a copy of the letter.

PALMER C. RICKETTS,
President, Rensselaer Polytechnic Institute.
Troy, N. Y.

Hon. Newton D. Baker,
Secretary of War,
Washington, D. C.

Dear Sir:

I have your circular letter of May 8 regarding the plan to be put in effect by the War Department to provide military instruction for college students of the country.

I shall be very glad to obtain information regarding the details of the new system, and in this connection venture to call your attention to the fact that engineering schools need about six hours a day of a student's time for recitations in theoretical subjects and laboratory work; each laboratory period takes at least 2½ hours.

The difficulty about the Engineer Officers' Reserve Corps was that for the last two years the schedule required two hours of the student's time each day for military drill and recitation. This added to the six hours would have made eight hours of the student's time taken in drill and recitations. This would include no time for study. It is not possible to properly teach engineering, including laboratory work, with four hours a day only of recitations; that is, the six hours could not be reduced to four and still have a school of engineering.

Last year we engaged an instructor, Major Nial, who had been 25 years in the State service, at our own expense, to give military drill here. This drill was elective. About 180 students took it. There is no doubt that we would enroll more than one hundred students here if the details of your new system were satisfactory. I do not see, however, how, if you require too much time for military work and recitations, we or any other engineering school can properly exist as an engineering school. Such schools will then become neither engineering schools nor military schools.

I sincerely hope that you will take this matter into consideration in fixing the details of the new system.

Uniform Catalog Sizes

Sir—We have noted Emile Low's letter, in your issue of May 16, on the matter of uniform size for catalogs. The writer recently received a letter from a correspondent in Denver, referring to a discussion held at the meeting of the National Association of Purchasing Agents in Chicago, May 22. Relating to the adoption of a standard size of 8½ x 11 in., our correspondent says:

"Being more of a catalog user than a catalog maker nowadays, I am not so much interested in the change in size, which might cause expense in production, but I am interested, as I should think a great many others would be, in a catalog size that would go into the ordinary sectional bookcase—I do not mean filing case, and I doubt if most of the ordinary bookcases will take a catalog 8½ in. wide."

Mr. Low asks for 8½ x 11-in. and 5½ x 8½-in. as the two standard sizes. The paper sizes which he quotes are standard for letter paper but are not standard for book paper and enamel paper, such as catalog are printed on. Quite a different range of paper sizes applies in this case, intended to give standard sizes such as 6 x 9 in., 7 x 10 in. and 9 x 12 in. The writer has used 6 x 9 in. as the standard catalog size for the past 16 years and has found it entirely satisfactory for illustrations, descriptions and tabulations of machinery and engineering subjects, covering a wide range as to size and detail. If a larger size is desired, 7 x 10 in. is certainly more practical than larger dimensions still, and it will be found that many of the catalog publishing houses which get out jobbers' catalogs employ this dimension. For subjects requiring a still larger sheet, if any, 9 x 12 in. would seem logical because this is the standard magazine size adopted by most engineering papers, such as *Engineering News-Record, Engineering and Mining Journal*, etc. Catalogs of this size can therefore be filed with convenience in filing cases or on shelves adapted to magazines.

The size of the type matter on this page is 7 x 10 in., which, in turn, is the size of the next smaller page referred to above. The writer agrees with Mr. Low in the desirability of having as few standard sizes as possible, and in considering the 8½ x 11-in. size very desirable for report blanks, stationery and office and factory forms. It has the disadvantage mentioned above that it does not fit in with the standard sizes of the book-paper makers. After all, it depends on what each office uses in the way of filing systems, whether bookcases, vertical filing, or note-book, which standard is preferable. Standard sizes of filing cases are available for 6 x 9-in. books, as well as for the larger sizes.

From the point of view of conservation, there is a good deal to be said in favor of the smaller page, as the cost of envelopes or other carriers increases very rapidly with increases in sizes and the weights of paper necessary.

The firm with which the writer is connected has employed the loose-leaf system of bulletins for a number of years with great satisfaction, in common with other manufacturers. That is, each page is not loose by itself, but each subdivision of a product, such as air compressors, for example, has a 16- or 32-page or 8-page bulletin by itself, and a uniform standard of punching is adopted.

When bulletins on two or more subjects are requested, the correspondent receives them in an inexpensive paper or cloth binder, which affords a convenient method for filing and preservation.

S. BOWLES KING,
Advertising Manager, Sullivan Machinery Company.
Chicago.

Sir—I was very much interested in a letter by Major Edgar A. Rossiter which appears in your issue of Apr. 25. It pertained to the standardization of size of all catalogs. I agree with Major Rossiter that when we arrive at some definite standard the real life of such material will be vastly increased. We have given considerable thought to this question for the past year and a half and have issued all of our catalogs in the standard letterhead size 8½ x 11 inches. We find that this will cut from paper 36 x 45 in. with a minimum af waste, and is also suitable for the purpose of filing, either in letter files or book cases.

At any rate, the size 8½ x 11 invites a system, and if all concerns would come to realize the value of standardization in this regard we would find ready coöperation onn the part of the purchaser.

There is just one point in Major Rossiter's letter which I wish to question, and that is: He says that 10 x 7½ is the logical size, because it would fit the sectional bookcase. Why sectional bookcases any more than regulation letter files or shelves?

There are many varieties of purchasing departments to be considered. Some few have sectional bookcases, others have not. Why deviate, therefore, from a size suitable for either file or case? Letter size, too, was approved by the Purchasing Association Meeting of 1917, and it seems to us that the letterhead size, with which every business man is familiar, would be the size to follow.

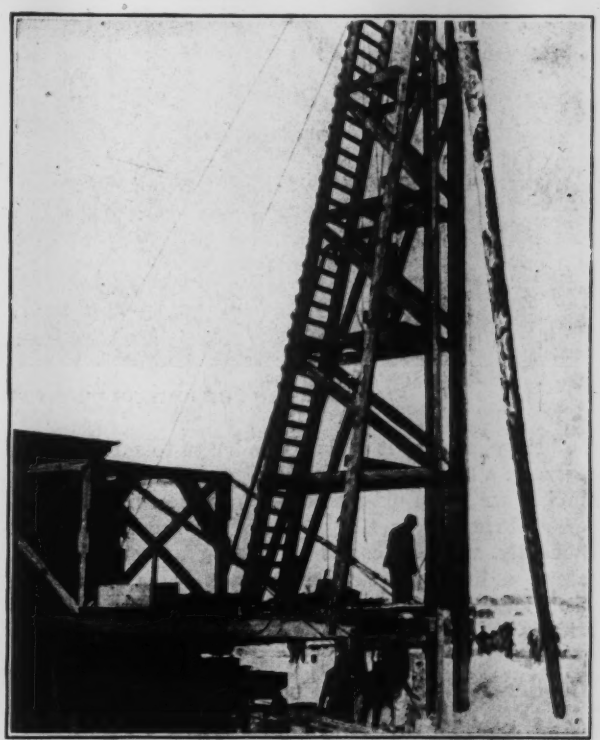
The suggestion I would have to offer is that the purchasing departments of both construction and industrial firms get together and agree on a standard size of catalog, so that the manufacturer and advertising agent may readily line up the printer and paper manufacturer to meet the demand.

I am now awaiting with interest a report from the Catalog Committee of the National Association of Purchasing Agents, which convened in Chicago May 22. I think that this committee will have some interesting facts for all of us on this question of uniform catalog size.

D. H. NICHOLS,
Managing Director Allied Publicity Bureau.
Cleveland, Ohio.

Claims Pile-Driving Record for Ore Dock on Lake Superior

Sir—We note in your issue of May 23 a statement that the pile-driver crew for the Raymond Concrete Pile Co. drove 165 piles in 9¼ hours at Hog Island. We attach hereto photograph of turn-table driver operated by this company, which drove 168 sixty-foot wooden piles in nine hours. This was done on the foundation work of the Northern Pacific ore dock at Superior, Wis., on Mar. 12, 1917. Piles were driven through four feet of ice and in 28 feet of water. A steam thawer was used to make holes for the piles.



THIS MACHINE DROVE 168 PILES IN NINE HOURS ON MARCH 12, 1917, AT SUPERIOR, WISCONSIN

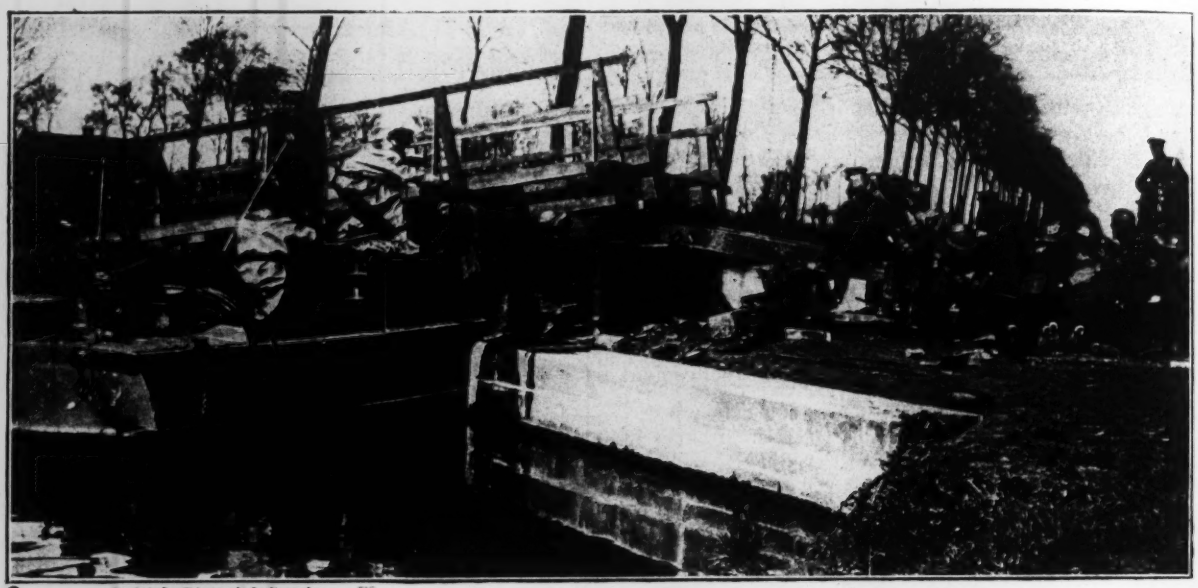
R. F. HELMERS,
Siems, Helmers & Schaffner, Contractors.
St. Paul, Minn.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Lift Bridge Improvised by Engineers on the Western Front

HOW a lift bridge was improvised on the British western front, is shown in the accompanying illustration which tells its own story. It became necessary to let the motor tug, shown in the picture, pass through the bridge, so that it could tow a barge to safety in the course of a German attack. The group of engineers are making use of an old-fashioned "pry" to raise the temporary bridge over the canal to the required height. Evidently, when it comes to getting a motor boat to safety, a little practical experience is as good as a whole lot of technical knowledge on the subject of drawbridges.



© *British Pictorial Service.*
ENGINEERS ON THE BRITISH FRONT PRY UP TEMPORARY BRIDGE TO PASS TUG

Roller Weighing 74 Pounds Finishes Walks in Housing Development

By W. M. KINNEY
Universal Portland Cement Co., Chicago

FINISHING one-course concrete sidewalks with a heavy roller is reported to have effected a saving of 50% in this operation on the work of the Gary Land Co. at Gary, Ind. It is asserted that one-course concrete is an improvement over two-course because it has greater strength and uniformity, and because it eliminates the bother of having two mixes of different proportions. The wide and successful use of one-course pavements for highways has inspired confidence in this type for sidewalk construction on housing developments. The rolling brings sufficient mortar to the top so that a good surface can be obtained with the aid of wood floats, and, by removing the surplus water, compacts and strengthens the concrete.

The Gary Land Co. specified one-course paving for 37,000 sq.ft. of walk for its ninth subdivision in Gary, Ind. Five-foot walks were made 4½ in. thick of 1:2:3 concrete. Since these walks are on sand this thickness is probably ample. The amount of cement required for this 4½-in. single-course walk is approximately the same as that used in a 5-in. two-course walk of 1:2½:5 base and 1:2 top. Pebbles from 1 in. to ¼ in. formed the

ROLLER FINISHES ONE-COURSE CONCRETE WALK

coarse aggregate and sand from ¼ in. down formed the fine aggregate. A ½-in. expansion joint was specified every 30 feet.

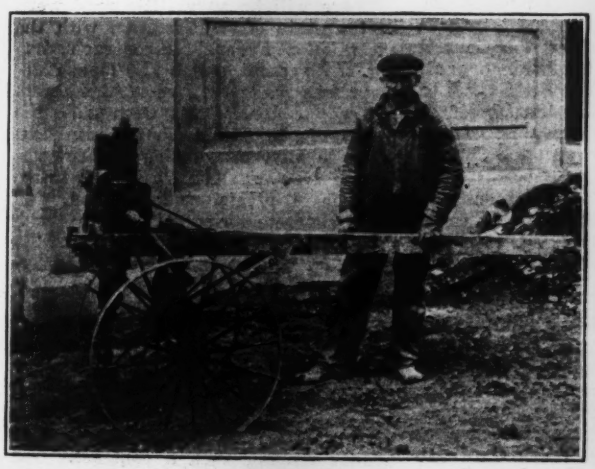
On this work, twenty or thirty minutes after concrete is placed, it is rolled longitudinally between expansion joints until mortar is brought to the surface, and the excess water, if any be present, is removed. The roller used is 18 in. in diameter, 3 ft. long, and is equipped with a light wooden handle, 19½ ft. long. Exclusive of the handle, the roller weighs 74 lb. It is believed to be none too heavy for sidewalk work, and perhaps a roller of greater weight would be even more effective.

After rolling, the edges are rounded and the surface is finished with wood floats. A groover is used to mark the walk into 5-ft. sections. With a one-sack batch mixer and a gang of 11 men, including two finishers, about 1500 sq.ft. of walk were placed in a day, a considerable percentage of which was 2- and 3-ft. width. The work is being done by the Powers-Thompson Co., of Joliet, Ill., under Mr. Farquharson, engineer for the Gary Land Company.

Rock Drill Mounted on Two-Wheel Truck Tamps Slag Fill

By E. J. Becker
Superintendent, Dravo Contracting Co., Pittsburgh

A ROCK drill of the Ingersoll-Rand E-24 type, mounted on a two-wheeled truck, as shown in the illustration, was used to tamp a slag fill 51 ft. wide and 265 ft. long, containing 1200 cu.yd. With it two men did the work of 12 men using hand rammers, and compacted the fill much better than could possibly have been done by that method.



ROCK DRILL RIGGED UP AS AUTOMATIC TAMPER

The fill to be made covered the entire area of a reinforced-concrete office building being constructed for the Dravo Construction Co. on Neville Island, Pittsburgh. The fill could not be rolled with a steam roller because of danger to the fresh concrete walls of the building.

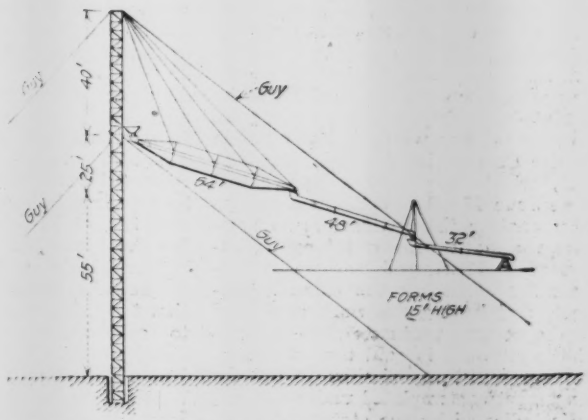
To avoid the unsatisfactory and expensive method of hand tamping, the drill was mounted as shown. It was operated by compressed air supplied through 75 ft. of ¾-in. hose. The face of the ram was made from a steel plate ⅝ in. thick and 10 in. in diameter, welded to a piece of drill steel.

Rig Concrete Tower Chute as a Boom

By S. S. Elkins
Junior Engineer, Engineer Department, United States Army

A SPOUTING plant which worked well with the first section of the chute rigged as a swinging boom, as shown in the illustration, was used on a recent Government contract.

The concrete was being spouted into place by the ordinary tower and chute method, the chutes being



CHUTE SUCCESSFULLY MADE INTO REVOLVING BOOM

hung by means of trolleys from cables. It was necessary first, to concrete at one end of the job, and then swing around about 160 deg. and pour the other end. This arrangement necessitated dismantling the spouting outfit each time, and moving it to the new position. In order to overcome this difficulty the first chute, which was 64 ft. long, was rigged as a boom. It could be swung from one position to the other in this way within ten minutes. This method was found cheaper than rigging up a boom.

Making Sanitary Surveys in Oklahoma

Statewide sanitary and health surveys are being made in Oklahoma cities under the auspices of the Oklahoma Association for the Prevention of Tuberculosis, with headquarters at Oklahoma City, and with the cooperation of the State Boards of Health and Agriculture. Consideration is being given to water-supply and water purification, sewerage and sewage disposal, garbage and rubbish collection and disposal, city milk supply, school hygiene and sanitation, vital statistics, the activities and organization of health departments and analyses of city budgets. Included in the studies are Oklahoma City, Tulsa, Muskogee, Enid, Shawnee, Bartlettsville, Ardmore, Chickasha and McAlester. M. P. Horowitz, of the Department of Biology, Massachusetts Institute of Technology, and Dr. Gayfree, professor of bacteriology and hygiene, University of Oklahoma, are in charge.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

New York Subway Dispute Is Settled

Labor Gets Increased Pay—Contracts Will Be Adjusted to Include War Cost

The strike of 7000 subway workers which threatened the completion of the dual system in New York City was ended on June 17, when the men went back to work at the increase of wages demanded, the city administration having agreed, apparently, to pay the increased cost of the work, occasioned by the war.

A settlement was reached at a conference between the Board of Estimate of New York City, the contractors for the new subway work, and the Public Service Commission for the First District, which was held behind closed doors June 15. The settlement apparently enables the contractors to complete the work without taking advantage of the Lockwood law, which provides for cancelling the existing contracts and having the work completed by the present contractors at the cost of the city. It is said the settlement involves something similar to the arrangement contemplated under the law, as is indicated by the statement given out at the conclusion of the conference, which follows:

"It is the sense of the members of the Board of Estimate and Apportionment and the Public Service Commission, participating in a joint conference:

"1. That unfinished subway construction work shall be carried to completion forthwith.

"2. That the men engaged upon the work shall receive the compensation which it is admitted is just.

"3. That there should be no general cancellation of existing contracts or release of sureties.

"4. That in the case of any contractor who declines to proceed according to the plan hereinafter set forth the Public Service Commission immediately proceed to complete the work under the terms of such contract, employing the necessary labor and utilizing the available plant of the contractor.

"5. That contractors having claims present them forthwith for consideration and adjustment.

"6. That contractors who have no claims for damages or delay and whose time for performance has not expired may have their contracts modified or supplemented upon their agreeing to complete the work within a shorter period than now required, and as a consideration to receive therefor a sum of money that will equal the increased cost of labor and material made necessary by the war.

"7. That all agreements of any kind modifying existing contracts must be consented to by the sureties.

"8. That any contractor who desires other or different relief under the Lockwood law may apply therefor without prejudice by reason of any of the foregoing on condition that he diligently continues his work."

That the contractors expect fair treatment and adequate consideration of their claims from the city and the Public Service Commission is indicated by a statement given out by the General Contractors' Association, which concludes:

"We intend to operate in the same spirit in which the plan was proposed by the public authorities, and expedite the work in every possible way."

Administration To Announce Plans for Reconstruction

Is Working, It Becomes Known, on Idea of Intrusting Reorganization to Enlarged Machinery of Council of National Defense

BY WINGROVE BATHON

Washington Representative, Engineering News-Record

A plan for a readjustment and reconstruction agency is under consideration, it has become known in Washington administrative circles, in an unofficial manner, following the presentation in *Engineering News-Record* and other McGraw-Hill engineering publications of a concrete plan for a proposed readjustment and reconstruction commission, to be appointed now by the President of the United States, to deal now with problems which will be presented to American industry after the war.

It is permitted to say here publicly for the first time that the Council of National Defense has been studying the subject of readjustment and reconstruction for a lengthy period, with a view to coördinating various Government activities in Washington which have had readjustment and reconstruction for their object. When President Wilson recently set up the War Industries Board, under the chairmanship of Bernard M. Baruch, as a separate agency, divorcing it from the Council of National Defense, the latter organization was left with but little work to do, and with but few prominent business men remaining in its personnel. There is reason for the belief that the Council of National Defense has resolved to undertake the work of readjustment and reconstruction, if permitted to do so by President Wilson, and there is also reason for the belief that the President will assent, under the urging of Secretary Baker of the War Department, chairman of the Council, acting in behalf of himself and the other five members of President Wilson's cabinet who compose the Council of National Defense. In Washington official circles there is an impression that this would be a logical step, inasmuch as a number of cabinet officials have begun making public details of readjustment and reconstruction ideals upon which their own departments and bureaus have been separately at work. There is ground in Washington not only for the impression but for the strong belief that if the Council of National Defense is authorized by the President to begin work on readjust-

(Concluded on page 1201)

Road Work Curtailed in State of Washington

There will be very little road work in the state of Washington, with the exception of Federal-aid contracts, during the present summer. This statement was made by James Allen, state highway commissioner, Olympia. The principal projects which the board expects to advertise during the summer are as follows: The Pacific Highway, between Olympia and Tacoma, 3½ miles concrete pavement; a reinforced-concrete arch bridge over the Cowlitz River on the Pacific Highway at Toledo; and the Sunset Highway from Waterville, east, and in the vicinity of Baird.

In addition to this work there will be considerable maintenance. Umatilla County will enter into a contract with the State Highway Commission for road maintenance, and will be the first county making such a contract. The terms of the contract will be, county 50%, state 50%, and will be applied to 10 miles of the Wild Horse Road which was paved last year by the state.

Appeal in Ohio Valley Company Water Rate Case

Appeal to the United States Supreme Court has been made by the Ohio Valley Water Co. in the water-rate case between it and McKees Rocks and other boroughs near Pittsburgh, Penn. The Public Service Commission of Pennsyl-

vania held that rates imposed Jan. 1, 1914, were excessive and ordered the rates lowered. This decision was declared illegal in a number of respects by the Superior Court of Pennsylvania in a decision rendered Oct. 8, 1917, abstracted in *Engineering News-Record* of Jan. 31, 1918, p. 216. On appeal to the Pennsylvania State Supreme Court the lower court was reversed and the decision of the Public Service Commission was upheld, the Supreme Court deciding that the Public Service Commission had full jurisdiction in matters of judgment. The water company bases its appeal to the United States Supreme Court on the ground that the reduced rates would be confiscatory and therefore a violation of the fourteenth amendment of the constitution in that the action would take the company's property without due process of law.

Urge McAdoo to Suspend Road Material Rates

Would Apply Them Only to Contracts in Force When the Increases Were Promulgated

Relying, it is said, on statements of state highway officials and contractors that the recent 15% freight rate increase and the additional increases, to become effective shortly, would cause serious loss to highway contractors and producers of road building materials, and would even ruin many of them, a group of state highway officials and contractors meeting informally with the Highway Industries Assn. at Detroit on Tuesday of last week determined to ask the Director General of Railroads to suspend these rate increases, as applying to road materials for use on work to be done under contracts in force prior to the promulgation of the increases. The gathering also requested the Highway Industries Assn. to communicate facts as to the retroactive character of these increases, with reference to highway contracts, to civic bodies and other organizations interested in road work. It was pointed out by the highway officials present that in only one or two of these States could contractors be relieved of their obligations, no matter how great an injustice might be suffered. Repeated emphasis was laid on the fact that the increases alone equalled in many cases 50% or more of the value of the material shipped.

Henry G. Shirley, secretary of the Highway Industries Assn., reported that the Office of Public Roads has indicated its willingness to bear half of the increase, provided the additional amount would not carry the State above its quota of Federal aid. He also stated that the railroad administration had signified its willingness to consider data bearing on the effect of the increases upon contractors, but that the rates would go into effect as announced. The rates promulgated in General Order No. 28, dated May 25,

(Concluded on page 1202)

Would Draft High School Graduates to Fill Engineering Colleges

Professor Richards of Illinois Makes Suggestions to War Department for Increasing Supply of Technical Men

A letter recently sent to the Secretary of War by Prof. C. R. Richards, dean of the college of engineering of the University of Illinois, contains the suggestion that the technical colleges be kept full by drafting students from the high and preparatory schools, and urges greater consideration for the importance of the engineering instructor and student. Unless something is done at once, says Professor Richards, to stimulate enrollment of students in the technical schools, the supply of technically trained men will soon become exceedingly small.

Increasing Demands for Men

The letter to the Secretary of War follows:

"I have been very greatly concerned over the ever increasing demands of the Army, the Navy, the various Government bureaus and the industries for men of technical and scientific training, since with the increasing demand for such men there is a decrease in the supply. Thus, the college of engineering of the University of Illinois has for a number of years graduated over 200 persons a year, not including those completing the curriculums in chemistry and in chemical engineering. This year we shall graduate only 121 persons from the college of engineering, and from present indications the number of graduates next year will be still smaller.

"During recent years there has been a growing appreciation of the importance of technical and scientific training by men who are engaged in industrial work, but never before has the importance of such training been so evident as at this time, when the need is so great to solve a variety of new problems quickly. It does not take a very long time to make an effective soldier from a man without previous military training and experience, but it does require a very considerable amount of time to train a man for expert scientific and engineering service. It seems to me, therefore, that the Government should exercise increasing care in the selection of men for the Army, to avoid the drafting of highly trained experts for service which can be performed almost as well by men who have had little educational preparation.

"As a result of my observations of the conditions which are affecting the training of men for service in technical and scientific lines, I feel justified in presenting for your consideration the following:

"1. I recommend that the requirements for the enlistment of students in the enlisted reserve corps of the engineering department, as formulated by the Chief of Engineers under date of Dec. 15, 1917, be revised so that any student who is a citizen of the United States and who is doing acceptable work may be permitted to enlist and to remain in college until he graduates, or until he shows inability or unwillingness to do satisfactory work. The present requirements for the enlistment of engineering students are so exacting that relatively few men can qualify. Many men whom we would be willing to certify as showing great promise are at present ineligible. As a consequence, I feel that the cumulative effect which would otherwise have been experienced from the privileges granted under these regulations has been seriously reduced.

"2. I suggest that students who are enlisted in the engineer enlisted reserve corps be regarded as on detached duty in the active service of the Government, that they be required to wear the regular uniform, and that they receive some stipend during the time that they remain in service to keep them. If they were paid $30 a month the total annual expenditure would be slight in comparison with other expenditures which the Government is compelled to make in the conduct of the war. The psychological effect of this plan on the students and the public would be of enormous value, and it would greatly assist in maintaining a reasonable supply of men in training for technical service.

"3. In my judgment, students in technical and scientific schools should not be permitted to enlist or be drafted unless it can be shown that they will not profit by the instruction given. They should be enlisted for instruction until they graduate. I recommend that every intelligent student who has completed two years' work in a technical or scientific school who has already been enlisted or drafted be returned to college or detached on duty until he graduates.

Students Not "Slackers"

"4. Many sentimental and misguided persons consider that a young man who fails to pass for active Army or Navy service is a "slacker," even though his training and experience render him more useful in scientific work than in the fighting branches of the service. It seems to me that every effort should be made to correct this impression.

"5. *If the conditions under discussion become more serious, as is likely to be the case, I recommend that approximately 2% of the boys graduating from the high schools be drafted for service as students in the technical schools of the country. This plan will be a part of compulsory education which may be fully justified on the score of national necessity.*

"6. Since all the preparations for war involve a great variety of educational processes, and since the technical and scientific colleges should be maintained at the highest rate of effi-

ciency, it is important that some provision be made at once to prevent the loss of teachers from these colleges. It requires a peculiar combination of qualifications to make a successful teacher of engineering or science. The drafting of such men is a serious mistake. If there is no other way to protect the successful teacher, the value of his services should be recognized by permitting him to enlist in some branch of the Army and be placed on detached duty or on the inactive list in the institution at which he serves."

To Prevent Water Shortage at Washington

Large increases in the population of the national capital have brought the average daily water consumption up to the safe capacity of the conduit supplying the city, which is 65,000,000 gal. a day. On May 28 the consumption was more than 70,000,000 gal. and on Feb. 5 a maximum of 80,590,000 gal. was reached. For the 30 days from April 30 to May 19 the average daily pumpage to the filters was 65,900,000 gal., compared with 51,590,000 gal. a year ago, an increase of 28%, according to a statement by Newton D. Baker, secretary of war, addressed to the chairman of the Committee on the District of Columbia of the House of Representatives.

Secretary Baker calls attention to the fact that the 1918-19 appropriation bill for the District of Columbia omits an item of $70,000 for "completing the purchase, installation and maintenance of water meters, to be placed on the water services to the United States buildings, reservations or grounds in the District of Columbia," which item was included in the District estimate for the year.

Attention is also called by Secretary Baker to his letter of Nov. 16, 1917, regarding the excessive use of water by the Government Printing Office and means for reducing it. Most of the 3,000,000-gal. daily consumption of filtered water at the printing office could be saved by supplying power to the printing office from the Capitol power plant, which uses unfiltered water for condensation purposes. The power requirements of the printing office, Secretary Baker states, now amount to only some 600 kw., while the Capitol power plant, with a capacity of 8000 kw., has an average load of only 2500 kw. A relatively small expenditure (unofficially estimated at $40,000) would make the necessary connections between the power plant and the printing office and save not only 2,500,000 to 3,000,000 gal. of filtered water, but the expense of pumping it, and also the expense of pumping the condensing water at the sewage-pumping station. Secretary Baker recommends that the Public Printer be called upon to make an estimate for a transmission line from the Capitol power plant to the Government Printing Office and adds that he regards this "as an urgent war measure."

Chicago Engineering Societies Unite for War Work

A joint war committee of 19 engineering and technical societies was formally organized June 4 in Chicago through the efforts of the Western Society of Engineers. The purpose of the organization is "to enable the technical societies of the Chicago zone to call into play the efforts of the members of the various societies as occasion may arise, and to coördinate their activities in the most effectual manner to help win the war." It is not proposed to attempt any novel "stunts" but rather to place at the disposal of the United States Government, and other authorized agencies, the combined strength and resources of the Chicago technical societies for war work, as need may arise. A survey of technical men available is one of the first activities proposed.

The officers of the committee are F. K. Copeland, chairman; W. L. Abbott, vice-chairman; E. S. Nethercut, secretary; and W. A. Fox, treasurer.

The executive committee consists of F. K. Copeland, W. L. Abbott, William Hoskins, C. A. Keller, Charles E. Lord, C. F. Loweth, Isham Randolph and Richard E. Schmidt.

Government Has Forty-Two Concrete Ships Under Contract

The United States Emergency Fleet Corporation has let contracts for 42, not 48, concrete ships as stated in these columns last week. These comprise two 3000-ton boats for which contracts were let some months ago, and five agency contracts of eight ships each, for two 3500-ton ships and six 7500-ton to one firm and for eight 7500-ton ships to four other firms, all as set forth in the note printed last week.

Toll Bridge Over Delaware River Bought By States.

Through purchase by the states of New Jersey and Pennsylvania the bridge over the Delaware River at Bridge St., Trenton, N. J., became free of tolls on June 1. It is the only one of the sixteen highway bridges connecting the two states that is free. Interstate bridge commissions of the two states arranged the purchase.

New Jersey Considering New Form of Highway Contract

The New Jersey State Highway Commission has directed William G. Thompson, state highway engineer, to draw up a new form of contract, for consideration, for state highway work. It is reported that the new plan will be based on cost plus lump sum; the contractor to receive a bonus for completing the work at cost less than the engineer's estimate, and to be penalized for exceeding this estimate. It is understood that this action was taken on account of the difficulty in getting desirable bids under the old system at the present time.

Discussing bids received recently, which exceeded the estimates, Mr. Thompson is reported to have said that while the cost is high, the Highway Commission believes that normal prices of labor and material will not return for several years, and if all road work is deferred until prices are better the present road system will be entirely destroyed by the rapidly increasing motor traffic; and that the State roads must not be permitted to go to pieces even though the cost of construction and upkeep is great.

Western Rail Territory Divided into Three Regions

Three new railroad regions have been formed from the Western region by the railroad administration. They are the Northwestern, Central Western and Southwestern. The first of these embraces the Chicago & North Western, Chicago, Milwaukee & St. Paul, Great Northern, Northern Pacific and other roads in that territory. The second includes the Santa Fé system, Chicago, Burlington & Quincy, Union Pacific, most of the Rock Island and Southern Pacific systems and other roads in the Central West. The third includes Missouri Pacific and Frisco systems, Missouri, Kansas & Texas lines, Kansas City Southern, parts of the Rock Island and Southern Pacific systems and numerous other lines in the Southwest.

R. H. Aishton, heretofore director of the Western region, remains with the Northwestern region as director. Hale Holden, president of the Chicago, Burlington & Quincy R.R., is made director of the Central Western region. B. F. Bush, president of the Missouri Pacific system, is made director of the Southwestern region.

C. H. Ewing, operating vice-president of the Philadelphia & Reading Ry., has been appointed Federal manager of that road. General managers announced for the Eastern region include E. M. Rine for the Delaware, Lackawanna & Western R.R.; J. J. Bernet for the New York, Chicago & St. Louis, and T. F. Brennan for the Buffalo, Rochester & Pittsburgh.

Oscar A. Price, secretary to the Director General of Railroads, has been made assistant to the Director General of Railroads.

Of the appointees, mentioned above, Mr. Bush and Mr. Ewing, as well as Mr. Aishton, are engineers. Mr. Bush was at one time division engineer of the Union Pacific R.R., and later chief engineer and general superintendent of the Oregon Improvement Co. Mr. Ewing, whose service has been mostly with the Philadelphia & Reading, left that road in 1893 to become chief engineer of the Central New England Ry., returned to the Philadelphia & Reading later and was engineer of maintenance of way when transferred to a superintendency.

Administration to Announce Reconstruction Plans

(Concluded from page 1198)

ment and reconstruction problems, W. S. Gifford, director of the Council, will set to work at once to coördinate all the work being separately done in the various departments and will undoubtedly call into consultation men in private industry of the type suggested in the article published in *Engineering News-Record* of June 6, p. 1031, which was put forth as a method of crystallizing opinion in favor of a readjustment and reconstruction agency and obtaining action to create one. In other words, it is in expectation in Washington that if the President assents, the Council of National Defense will be newly created by the appointment of a large number of committees of important men taken from the ranks of private endeavor. It will then undertake to solve the after-the-war industrial problems of this country, along the lines on which England is now working, as described on page 1177 of this issue.

Urge Creation of Agency

Before this is published, the question of what character of readjustment and reconstruction agency shall be established may have been settled. It is possible that when the news announcement of the Government's intentions in this respect is made, it will have been found after due consideration that it might be more wise to commit the work of readjustment and reconstruction to an agency other than the Council of National Defense; but the subject is now being discussed on all sides in Washington, and letters and telegrams from all over the country are being received in Washington urging the creation of such an agency at once.

From Philip H. Gadsden, chairman of the National Committee on Public Utility Conditions, comes a letter strongly indorsing the idea of action. The National Committee on Public Utility Conditions, which includes E. K. Hall, H. H. Crowell and A. S. Hills, executive secretary, represents in Washington the National Electric Light Assn., the American Electric Railway Assn., the American Gas Institute, and the National Commercial Gas Assn., Mr. Gadsden says:

"It is coming, I think, to be more and more generally realized that the problems which the industrial world will have to face after the war in the readjustment of our economic life will be more serious than even the problems which we are now called upon to meet. Your suggestion, therefore, that the President at this time appoint a commission on readjustment and reconstruction, is, in my judgment, a very timely one.

"The great lesson which this war has impressed upon every one is the efficiency resulting from great concentration of capital and labor. The benefits derived by the nation for war purposes in the mobilization of practically all the industries of the country will not be lost sight of when peace comes. To deal properly with such a radical change in our economic policy will call for all the wisdom at our command. Nothing could aid so much in the proper solution of such a problem as a thorough and comprehensive study of it in advance, such as you suggest."

From The Permutit Co., New York, engaged in water rectification and general sanitation, comes this letter, signed by Samuel Robert, president of the company:

"As we see it, there can hardly be room for doubt as to both the usefulness, and, indeed, the necessity, for the work of the nature referred to, and that this work should be done as quickly and as thoroughly as possible.

"We can think of no better way to prepare the ground work essential to the proper accomplishment of this vital project (vital to the future benefit of the industries of this great country) than by having a commission appointed as quickly as possible for the express purpose of investigating the necessary steps needed to prepare for its accomplishment, and then to put into effect as thoroughly as possible the means needed for its fulfillment. We are in hearty accord with this movement."

Post-War Trade Demands

From Charles F. Lang, president of the Lakewood Engineering Co., Cleveland, Ohio, comes this letter:

"While our company is working night and day on war service for the Government, and is constantly endeavoring to expand its usefulness in this direction, all our planning is being done with a view to world trade conditions after the war, for we feel that we but dimly realize the demands which world trade will make upon American manufacturers in the reconstruction period immediately following the war.

"And we also recognize the period of tremendous readjustment which must take place in our own country. National conditions and national ideals are entering a violent revolution rather than a slow evolution, and I sincerely trust that the very constructive program suggested by you will receive serious consideration and prompt action on the part of the Government; for the problems involved are not merely national, but world problems; and individual thinking by individual business men is hopeless; the nation must think and plan *as a nation.*"

Too Many Programs, Says Mr. Filene

From the merchandising house of William Filene Sons Co., of Boston, comes this letter, signed by Edward A. Filene, its president, who is chairman of the war shipping committee of the Chamber of Commerce of the United States:

"I am in entire agreement with your suggestion that such preparation should be under way. Unless there is created a Governmental agency for this undertaking, an agency thoroughly representative of all classes and interests, these problems will be taken up separately by the various classes and interests.

"If the bulk of the reconstruction planning is left to separate classes and interests, we shall come to the end of the war with a series of reconstruction programs. Business will have a program; labor will have a program; agricultural interests will have a program; banking interests will have a program; Socialists and holders of related theories will have a program. And, at the very moment when unity of purpose and promptness of action will be vital to the welfare of the country we shall be obliged to pay the price of costly delay incident to the harmonizing of these several programs of reconstruction.

"It is clearly the wise policy to create a Governmental commission so thoroughly representative of all classes and interests that it will command the support of all classes and interests. If such a commission collates its facts, formulates its conclusions, and submits them in advance to the most exhaustive criticism from all possible angles, we shall be able to get most of the work of compromise out of the way by the end of the war and arrive at the time of action with a unity of purpose and policy otherwise impossible.

"I realize the question of tactics and timeliness involved in any proposal today not related to the immediate job of prosecuting the war; and yet, the war will end some day, and whether that time be one year or twenty years from now, the time will be none too long for the analyses of the complicated problems that underlie the return of our social, industrial, and political life from a war basis."

New York City College to Give Summer Military Courses

The College of the City of New York will give four courses on military subjects at the summer session this year. Military surveying and mapmaking, which will comprise both field and class work, will be given by Professor Autenreith and Mr. McLoughlin. It is reported that all of the men who took this course last year are now in military service, and that all but three are officers.

Airplane mechanics, by Professor D. B. Steinman, will deal with the theory underlying aërial propulsion and its application to military work.

Ship building and navigation, by John Martin, formerly executive and navigation officer of the U. S. S. "Alexander," is designed to prepare young men for service as draftsmen in shipyards, and also to enable them to enter the Navy with the rank of petty officers. Students in these courses will be given practice work in shipyards and on board a ship at City Island. Courses in telephony and telegraphy will be given by Lauren S. O'Roark, transmission engineer, Western Electric Co., and George W. Jan-

son, assistant to chief engineer, Western Union Telegraph Company.

Further information concerning registration and dates may be secured upon application to Prof. Paul Klapper, director of the summer session, 139th St and Convent Ave., New York City.

Massachusetts May Operate Bay State and Other Street Railways

Following up the legislation for state control and operation of the Boston Elevated Ry. system described in *Engineering News-Record* of May 30, p. 1063, the Massachusetts legislature has now enacted two other laws framed on similar lines. One of these laws provides for public control of the Bay State street railway system, which includes a large network of city and interurban lines in the suburban territory around Boston. As in the Boston Elevated act, the roads are to be operated by five trustees appointed by the Governor. To effect the transfer, a new company is to be organized, which may issue securities for the purchase to an amount not greater than the investment value of the property, nor shall these securities require outlays for fixed charges and dividends greater than 6% on $40,240,000. Provision is made, however, for raising additional capital for expenses and improvements.

As with the Boston Elevated, the trustees must fix rates of fare which will be sufficient to meet the "cost of the service," which includes return on the capital, depreciation, etc., as well as operating expenses. Fares are to be increased or decreased quarterly, as may be necessary to make the income match the cost of the service.

At the expiration of the 10-year period, the company may continue operation as a private company; but it is said the probabilities are that before that time a complete transfer to public ownership will be made, as provided for in the law.

The second act enables any other electric railway company in the State to establish the "cost of service" principle, and thus obtain authority to fix fares sufficient to pay its fixed charges and preferred stock dividends and 6% dividends on the common stock investment, as determined by the Public Service Commission. In this case, instead of the State taking entire control through the appointment of public trustees by the Governor, provision is made for the appointment by the Governor of three directors of the company to represent the public. In addition, the State Public Service Commission is to divide the State into street railway districts, and appoint one or more resident supervisors for each district. This act also provides that any company accepting it thereby agrees to sell its entire property and franchises as a going concern to the State, or any city therein, for an amount equal to the stock investment, plus the preferred stock, the purchaser assuming the bonds, contracts, leases, and all other outstanding liabilities of the company.

Urge McAdoo to Suspend Road Material Rates

(Concluded from page 1199)

1918, are in addition to the recent raise of 15%. The new increases, effective June 25, are 20c. per ton on crushed stone, sand and gravel, and 40c. per ton on brick and cement. Contractors and highway officials present reported raises under the 15% raise of 25% in the rates, though none knew the reason for the discrepancy, it was asserted.

Reporting on conditions in various States and localities, contractors gave figures showing increases on individual contracts varying from $1000 to $6000. George E. Johnson, state engineer of Nebraska, gave the total increase on contracts in force under his jurisdiction as $125,000, while Mr. Shirley said that on country projects concerning which his office had details the increase would be $1,600,000 if all the contracts were let.

Says State Laws Prevent Relief

J. D. O'Neil, state highway commissioner of Pennsylvania, asserted that under the State's laws it was not possible to extend relief to contractors, that the stronger contractors were continuing their work with the hope of securing reimbursement through action of the next legislature, but that the weaker contractors were putting their work in the best shape possible preparatory to necessary abandonment. The highway department in these cases is granting extensions in the hope of adjustment through legislation that will permit completion later. The New York legislation was cited to show that in one State, at least, relief has been afforded.

Representatives of several States pointed out that they supplied the materials and that they and not the contractor would bear the increases. As a result of discussion of this phase of the matter, and the necessarily smaller mileage that can be built with the available funds, the meeting asked the Highway Industries Assn. to urge upon the railroad administration reconsideration of the rates on road-building materials.

Directors Adopt Resolution

Following the meeting the directors of the association adopted the following resolution, which had been approved by the meeting, and which has now been presented to the Director General of Railroads:

Whereas, the highways of the country are recognized universally as arteries of commerce essential to the prosecution of the war; and

Whereas, the maintenance and construction of necessary highways require the successful continuance of existing contracting organizations and of producers of road-building materials, interests involving over $1,000,000,000 in invested capital; and

Whereas, the freight rates on road-building materials promulgated by the Director General of Railroads in General Order No. 28, dated May 25, 1918, is retroactive with reference to existing contracts for road work in all parts of the country; and

Whereas, such retroactive effect will result in serious financial loss, amounting to a very large percentage of the whole value of such contracts and entailing financial ruin to many contractors and producers of materials, without gain to the State; and

Whereas, existing state statutes prevent public officials from giving relief to contractors on public works who suffer loss by reason of these freight-rate increases; therefore, be it

Resolved, that the Highway Industries Assn. urge upon the Director General of Railroads that such increased freight rates be suspended in so far as they apply to materials necessary for the execution of work under contracts in force prior to the promulgation of said Order No. 28.

Among the highway officials present, besides those already mentioned, were A. B. Fletcher, state highway engineer of California; W. G. Thompson, state highway engineer of New Jersey; F. F. Rogers, state highway commissioner of Michigan; C. M. Keer, engineer of maintenance, Louisiana Highway Department; Rodman Wiley, state highway commissioner of Kentucky, and M. J. Cunningham, state engineer of Oklahoma.

Colored Insert, "Our Marines"

"Our Marines," another poster in colors by Victor Perard, who produced the cartoon, "Is This My Boy?", is published as a supplement to this issue. Just as the Highlanders were euphoniously christened the "Ladies from Hell" when they made their appearance in Belgium earlier in the war, so our Marines have been dubbed the "Devil-Hounds." It is suggested that the caption is accurate, inasmuch as they are busily engaged at present in hounding the devil; and that perhaps others of us than the Marines can find opportunity to take a hand in the game of devil-hounding, if we will but bestir ourselves.

Hudson River Bridge and Tunnel Commission Organized

Members of the New York State Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission met jointly June 13 and formed an organization to promote the crossing of the Hudson at New York City. As has been reported, the present intention of the joint commission is to urge the construction of a six-way highway tunnel.

Thomas N. McCarter, of Newark, N. J., was elected chairman of the joint commission and Edward A. Byrne, chief engineer of the Department of Plant and Structures of New York City, was chosen as engineer, serving, for the present at least, without compensation.

The New Jersey Commission has also

engaged Prof. Warren P. Laird, of the University of Pennsylvania, to advise it regarding the location of a bridge across the Delaware River between Philadelphia and Camden.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION; University of Pittsburgh; June 26-29, Northwestern University, Evanston, Ill.

AMERICAN CONCRETE INSTITUTE; 27 School St., Boston; June 27-29, Atlantic City, N. J.

AMERICAN SOCIETY FOR TESTING MATERIALS; University of Pennsylvania, Philadelphia; June 25-28, Atlantic City, N. J.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS; 29 West 39th St., New York; June 26-28, Atlantic City, N. J.

The Rochester Engineering Society, Rochester, N. Y., held its last meeting of the season June 14. O. E. Carr, city manager of Niagara Falls, N. Y., delivered a paper on "The City Manager Plan and Its Relation to the Engineer."

The Springfield Engineers' Club, Springfield, Ill., was addressed at its June meeting by H. B. Piepmeier, maintenance engineer, department of highways, State of Illinois, on the "Maintenance of the State Highways by the Department of Highways," Mr. Piepmeier's paper was illustrated by motion pictures, showing the construction and maintenance of various roads throughout the country.

The Russian Society of Engineers, Chicago, held a banquet June 8 at the Hotel Sherman, at which Prof. G. W. Lomonosoff of the Russian commission to the United States spoke on "Russia and What We Can Do for Her at Present."

The Associated Engineering Societies of St. Louis held a joint meeting June 3, at which Wallace R. Harris, Regina, Canada, read a paper on "Reinforced-Concrete Pressure Pipes."

The Engineers' Society of Milwaukee held its annual dinner and last regular meeting June 12. H. M. St. John of the testing laboratory, Commonwealth Edison Co., Chicago, presented an illustrated paper on "Products of Electric Furnaces and the Cost of Their Production."

The New Jersey Assn. of County Engineers will hold its next regular meeting June 21-22 at Mount Holly, at which important matters bearing on the New Jersey State specifications, return loads and standard direction road signs will be discussed.

The Oregon State Drainage Assn. held its first annual meeting in Portland June 4. The meeting was largely devoted to a discussion of the increase in agricultural products which could be obtained through the drainage of overflow lands. S. B. Hall, a Multnomah County agriculturist, stated that the reclamation of the Multnomah district, comprising less than 8000 acres, will increase the agricultural products of the county by more than 50%. Other speakers of the session were W. H. Crawford, representing the Chamber of Commerce; R. B. Magruder, Clatskanie; L. S. Kayes, of Kelso, and T. A. H. Teeter, of the Oregon Agricultural College.

The Engineers' Club of Dayton, Ohio, held its annual meeting, the last meeting of the season, on June 4. Laurence H. Hart of Buffalo delivered an illustrated lecture on the New York State Barge Canal. The following officers were elected: President, Col. E. A. Deeds; vice-presidents, Charles F. Kettering, Orville Wright, and F. O. Clements; treasurer, Edward Wuichet; recording secretary, D. A. Kohr.

The Colorado Assn. of Members of the American Society of Civil Engineers held its tenth annual meeting June 15. It was preceded by a dinner at the Denver Athletic Club. C. A. Fisher, consulting geologist, Midwest Refining Co., addressed the meeting on "Physical Conditions Under Which Oil Occurs and the Various Fields in the United States." No meetings of the association will be held during July and August. The luncheons will be continued as usual.

The Louisiana Engineering Society held its last meeting in New Orleans June 10. Howard Eggleston, industrial engineer of the New Orleans Assn. of Commerce, presented a paper on the situation regarding the introduction and use of natural gas in New Orleans.

PERSONAL NOTES

J. H. NUELLE, general superintendent and formerly chief engineer of the New York, Ontario & Western Ry., has been appointed general manager by the director of the Eastern region of the railroad administration. Mr. Nuelle, a graduate of Princeton University in 1906, started work that year with the Pennsylvania R.R. The next year he went to the New York, Ontario & Western as assistant engineer, and was successively promoted to be principal assistant engineer, engineer maintenance of way, chief engineer, assistant general superintendent and general superintendent

W. B. WOOD, general manager of the Grand Rapids & Indiana Ry., has been retained as general manager under the railroad administration. Mr. Wood is an engineer and was division engineer on the Pennsylvania lines west of Pittsburgh before his promotion to be division superintendent in 1903.

W. H. KIMBALL, consulting engineer of Davenport, Iowa, has been appointed assistant engineer to the United States Bureau of Industrial Housing and Transportation, Department of Labor, under John W. Alvord, consulting engineer, to have charge of outside work on water-works and sewers. W. H. Durbin, formerly assistant engineer with the Indianapolis Sanitary Commission, has office charge of similar work.

PHILIP G. WILSON, assistant engineer, valuation department, New York Central Railroad Co., has been transferred from the Cleveland office to the New York office.

F. M. MAHARD has resigned as superintendent of construction of the American Can Co., Montreal, to become designing engineer for Monks & Johnson, Boston.

CHESTER P. SIEMS, William F. Carey and Henry S. Kerbaugh have become associated under the firm name of Siems, Carey-H. S. Kerbaugh, Inc., for the purpose of carrying on a general engineering and construction business, with offices at 120 Broadway, New York City.

JOHN C. PRIOR, until recently assistant engineer to Alvord & Burdick on the flood investigations for the Franklin Conservancy District, and engaged in the Columbus, Ohio, city engineer's office at various times, is chief cost accountant in the United States Bureau of Industrial Housing and Transportation, Department of Labor.

CLARENCE E. RIDLEY, formerly assistant city engineer of Flint, Mich., has become city engineer and superintendent of water supply of Port Arthur, Texas.

DANIEL HUBBARD, division engineer, Baltimore & Ohio Southwestern R.R. at Flora, Ill., has become division engineer of the Newark division of the Baltimore & Ohio R.R. with headquarters at Newark, Ohio.

A. W. HADDOW has been appointed city engineer of Edmonton, Alta., Canada. He was appointed assistant city engineer in 1911.

LEROY K. SHERMAN, consulting engineer of Chicago, and formerly principal assistant engineer, Sanitary District of Chicago, has been appointed principal assistant engineer to John W. Alvord, consulting engineer of the United States Bureau of Industrial Housing and Transportation, Department of Labor. Mr. Sherman is stationed in Washington.

THOMAS H. REED has resigned as city manager of San José, Cal., and will return to the practice of law in San Francisco and to the professorship of municipal government, University of California, which he held previous to

assuming the city managership of San José two years ago.

WALTER E. BAUMGARDNER, formerly city engineer, Albion, Mich., has been elected city manager of Albion, succeeding A. L. Sloman, now in military service.

SIDNEY M. JOHNSTON has been appointed temporary city engineer of Stratford, Ont., pending the return of A. B. Manson, now assisting the Canadian engineers in war work.

JAMES C. WARDROP, engineer on the staff of the works department, Hamilton, Ontario, has resigned to become associated with F. R. Warren, architect.

R. J. BODMAN, formerly of the State Highway Commission, Missouri, has become chief engineer for the Burrell Engineering Co., Oklahoma City, Okla.

MORTON MACARTNEY, formerly city engineer of Spokane, Wash., is now in charge of the Government sewer and water-supply construction work on the storage depot project at Columbus, Ohio.

ROGER TAYLOR has severed his connection with Frederic DeP. Hone & Co., consulting engineers, New York City, of which he has been a member for the past two years, to accept a commission in the Ordnance Reserve Corps.

L. F. HARZA, formerly chief engineer in charge of design and construction of the 20,000-hp. Canadian hydro-electric development at Sault St. Marie, Ont., has been sent to Jacksonville, Fla., by the Emergency Fleet Corporation, to take charge of the proposed concrete shipyard.

HERBERT V. CLOTTS, formerly engineer in the United States Indian Irrigation Service, has been appointed superintendent of irrigation district No. 4, with headquarters at Los Angeles, Calif. District No. 4 includes Southern California and Arizona.

C. L. POST, vice president of the Condron Co., structural engineers, Chicago, has been made supervising engineer under Maj. H. S. Crocker, constructing quartermaster in the construction division, Quartermaster Department, for the New York district.

CHESTER G. WIGLEY has resigned as chief of the bureau of engineering, State Department of Health, New Jersey, to become associated with Wallace & Tiernan, New York City, manufacturers of special water-works equipment.

GEORGE W. BERRY, Chicago, has been commissioned major in the Engineer Reserve Corps.

E. LOGAN HILL, assistant general manager of the Erie R.R. has been granted leave of absence to serve as secretary of the United States Shipping Board Commission on Port and Harbor Facilities. The commission has been appointed for the purpose of improving port and terminal facilities, to the end that ships may be unloaded, repaired, bunkered and reloaded with the minimum loss of movement and time.

KARL R. KENNISON was recently transferred from the bureau of yards and docks, Navy Department, to the division of shipyard plants, Emergency Fleet Corporation, with headquarters at Philadelphia.

LE ROY SMITH, assistant state highway engineer of Michigan, has been appointed engineer-manager for the Wayne County, Mich., Highway Commission, and will assume much of the executive work which has heretofore been handled by the commissioners.

EARL DEVENDORF, formerly in charge of the sewage disposal plant at Schenectady, N. Y., as assistant engineer, has been appointed assistant engineer in the New York State Board of Health.

C. R. TWISS, city engineer of Vicksburg, Miss., has resigned to enter the Engineer Corps with the commission of captain.

WILLIAM H. FINLEY, chief engineer of the Chicago & North Western Ry. Co., has been elected president, succeeding R. H. Aishton, who resigned to enter the service of the United States railroad administration. Under the new form of railroad organization, created by the recent order of the Director General, Mr. Finley will have no direct part in the operation of the road, but will represent the interests of the stockholders. Mr. Finley was born in Newcastle County, Delaware, and received his early training in the public schools of Wilmington, Del., in a newspaper office, and at the Edge Moor Iron Co. In 1887 he entered the bridge and building department, Chicago, Milwaukee & St. Paul Ry. Co., where he remained until 1892, when he entered the service of the Chicago & North Western as engineer of bridges. Since that time he has been principal assistant engineer and assistant chief engineer, being appointed chief engineer in 1914. He was elected president of the American Association of Engineers on May 14.

SYLVESTER Q. CANNON, city engineer of Salt Lake City, has been assigned to the superintendency of the city water-works, in addition to his duties as city engineer. This action has been taken as a war economy measure.

LAUDER W. JONES, until recently professor of chemical engineering, University of Cincinnati, who was appointed last month dean of the school of chemistry, University of Minnesota, is now in charge of gas offense, chemical research, at the Bureau of Mines Experimental Station, American University, Washington, D. C.

MAJ. MALCOLM ELLIOTT, 309th Engineers, has been commissioned lieutenant colonel of that regiment, succeeding Lieut. Col. Jarvis J. Bain, who was promoted on the death of Col. William L. Guthrie. Previous to entering the first officers' training camp at Fort Benjamin Harrison, Lieutenant Colonel Elliott was a civilian engineer in the office of the United States Engineer, Louisville, Ky. He was graduated from the first officers' training school, Fort Benjamin Harrison, with the rank of captain and was later promoted to the rank of major. Lieutenant Colonel Elliott served for several years in engineering work with the Isthmian Canal Commission, during which time he had charge of all stream gaging for the investigation of the water supply of the Panama Canal.

JOHN W. F. BENNETT of the firm of Ernest P. Goodrich and A. Pearson Hoover, consulting engineers, New York City, has been commissioned major in the quartermaster corps, National Army, and assigned to duty in the construction division. Previous to his association with Goodrich & Hoover, Major Bennett was in the service of the City of New York for eight years, first as deputy commissioner of water supply and later as consulting engineer.

C.-E. A. WINSLOW, professor of public health, Yale University, received the degree of doctor of public health at the 86th annual commencement of New York University.

GUY G. HARVEY has resigned as county engineer, Lincoln County, Washington, to accept the appointment of construction engineer.

GEORGE M. ZIMMERMAN has resigned as city manager of Sandusky, Ohio, and will become associated with the Hord Color Products Co. of that city.

EDGAR S. CLOSSON, consulting engineer, Montclair, N. J., has closed his office for the duration of the war to remain at Mobile, Ala., as resident engineer in charge of concrete shipbuilding for the United States Shipping Board, Emergency Fleet Corporation.

OBITUARY

ROBERT E. MCMATH, former sewer commissioner and president of the Board of Public Improvements, St. Louis, died recently in that city. He was born in Seneca County, New York, in 1833. He was graduated from Williams College in the same class as James A. Garfield. From 1859 to 1862 Mr. McMath was deputy surveyor of St. Louis County, and for the following three years he was a member of the United States Coast Survey corps, assisting in running the transit route across Nicaragua. Later he was in the service of the United States Engineer Corps, in charge of the improvements of the Mississippi River from the mouth of the Illinois River to the mouth of the Ohio. Mr. McMath became a member of the Board of Public Improvements of St. Louis in 1891, and was afterward elected president of the board.

NEWS OF ENGINEERING INDUSTRIES

FOR MANUFACTURERS WHO SERVE ENGINEERS AND CONTRACTORS

Manufacturers and Publishers Confer on Co-operation for Post-War Conditions

Discuss Preparations for Peace and Plan Closer Relations for Benefit of Manufacturers and the Country

To secure full coöperation between publishers of technical journals and the manufacturers represented in the Allied Publicity Bureau, of Cleveland, a meeting was held in Chicago June 17. Much of the discussion of the relationship of the publishers and the manufacturers turned upon the necessity for close study of post-war conditions and the need for coöperation between manufacturers and publishers, in order that these conditions may be successfully met. While the attendance of manufacturers was limited to those whose advertising is handled through the Allied Publicity Bureau, the topics were treated broadly and the suggestions are generally applicable. S. T. Henry, vice-president of the Allied Construction Machinery Corporation, acted as chairman of the meeting. Eighty-five were in attendance. On June 18 a group began a tour of the plants in order to study closely the products and problems of the manufacturers present.

W. S. Kies, vice-president of the American International Corporation, made the chief address. In discussing foreign trade, from the standpoint of the American manufacturer, he pointed out that, although concentration on efforts to win the war is absolutely necessary, it may result in failure to prepare properly for conditions after the war. "This would be a great calamity. Other nations are preparing. We will be in danger of widespread suffering and possible disorder from unemployment unless we foresee conditions and are ready to meet them," said Mr. Kies.

Before the war, he pointed out, we had a surplus manufacturing capacity that was gradually being used to serve export trade. The development had been sufficient to show its stabilizing influence on domestic conditions. But then we were working under the handicaps of lack of sympathy with foreign conditions, lack of merchant marine and of banking facilities. Moreover, we found prejudices against us in certain countries.

Mr. Kies went on to say that since all essential factors have changed, we will have a much larger surplus of manufacturing capacity offering greater promise as a domestic stabilizer if properly used. At the same time we are building a merchant marine, American banks are being established and, most important of all, we have not merely learned to think internationally, but our unselfish attitude in the war has broken down the prejudices that existed against us, in his opinion. It is the duty of publishers and manufacturers, he continued, to emphasize constantly the necessity for export trade as a savior from after-the-war disasters, so that the nation will make preparations to develop it.

Speaking of general preparations for peace, he maintained that when the treaty of peace is signed our problem will not be solved. Our difficulties then will be only beginning. We went into war unprepared and great has been the resulting loss. The results will be equally serious if we make no better preparation for peace.

As to the attitude of other nations toward future export business, he reminded his hearers that the foreign countries were not merely making plans for great expansion but were actually doing business in countries from which

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Dump Cars Replace Gondolas for Carrying Sand and Gravel

Use of large dump cars for railway transportation of sand, gravel, stone and slag is resulting from the Government prohibition of the use of gondola cars for such traffic on account of the car shortage. It is reported that the Commonwealth Steel Co. and the American Steel Foundries Co., Granite City, Ill., are handling molding sand in 12-, 16- and 30-yd. dump cars, while 30-yd. cars are used for handling slag by the Carnegie Steel Co., Youngstown, Ohio, and the Corrigan-McKinney Co., Cleveland. Sand and gravel are hauled in 16-yd. cars by E. G. Grant, Greenfield, Ind., to contract work at Rushville. The Long Island, Missouri Pacific, Rock Island and other railways are also said to be using cars of this class for similar service in connection with construction work on their lines where gondolas were used previously.

New $8,000,000 Government Munition Plant

The establishment of a new $8,000,000 war munition plant near Sandusky, Ohio, marks another step in the Government program of moving important war industries away from the coastal cities and districts where attack by submarines and airplanes is possible.

Increased Freight Rates Generally Approved

Manufacturers Believe Benefits from Improved Service Offset Loss from Sudden Rise in Cost

With few exceptions, manufacturers, generally approving the increase in freight rates, assert that the better service made possible thereby will tend to reduce ultimate costs. They maintain that it is necessary to look beyond the mere rise of immediate costs and consider that the repressive actions of the State and national legislatures have resulted in serious reactions on the manufacturing, contracting and general public interests, so that the reductions sought have been more than offset by higher ultimate costs due to inconveniences and delays in transit between producer and consumer.

On the other hand, contractors and certain manufacturers, especially those in smaller fields, state that on account of what they call the exceedingly short time allowed for the rates to take effect as well as the sudden announcement, they have been unable to provide for it in their contracts and, in consequence, have had their profits greatly reduced if not entirely wiped out. They have taken prompt steps to lay their problems before the railroad administration, and these are being considered in conference in Washington, where means for relief are being worked out.

Leaders in the road materials industry of Ohio agree that the new freight rates will be disastrous to contractors who have work under way, and that the move will tend to hamper the construction of highways, in their part of the country at least, just at a time when the building and improvement of highways is of prime importance to the country in relieving the menace of railway congestion.

Will P. Blair, secretary of the National Paving Brick Manufacturers' Assn., with headquarters in Cleveland, says:

"The new freight rates will without doubt very seriously affect existing contracts. The new order will tend to bankrupt either the contractors or the material men, that depending, by the terms of the contracts, upon whoever is required to bear the burden of the increased freight rates. I have one complaint before me now, which shows that one contractor loses $1700. This is only one small item. I fear to contemplate the far-reaching effects this move will have.

"As far as brick roads are concerned, this increase of 40c. a ton means $2 per thousand for the increased rate, and paving brick were never sold for so low a profit. It is doubtful to us

whether any contract existing, which is affected by the increase, can be executed. The move will almost certainly tend to reduce road building."

Tieup of road construction, in Ohio, at least, is seen by officials of the Cleveland Macadam Co. E. C. Roberts, general manager of the company, says:

"The new freight rate order will greatly decrease the number of new roads built and those repaired. The state has voted only a limited amount for this purpose, and the new freight increase will not be an aid to new work. Consequently, fewer new roads will be built."

F. A. Sarstedt, president of the National Slag Assn., says: "We have no objection to the increase in freight rates. We realize the railroads need more money. What we do not approve of, however, is this bolt out of a clear sky, which will work a grave injustice to contractors. We will work with the committee that seeks to have the old rates kept in effect on present work and contracts that have been advertised and let. If this is not done, a tremendous loss must be sustained by many contractors. As far as the rates will affect slag interests, I do not believe it will amount to anything, as practically all slag producers quote f.o.b. plant."

However, this distress in the road-building industry is not marked, it is said, where, as in the East, water routes are sufficiently extensive and numerous to permit the handling of materials exclusively by barging.

Manufacturers Not Affected

Those manufacturers are not affected whose products are such as machinery, slag and others on which quotations are f.o.b. factory, or those who quote delivered prices, contingent on freight rates and other causes. They report that the demand at present is so heavy that any curtailment would act, in a measure, as a relief. They do not believe it possible, however, that curtailment will be permanent, because the demand is too heavy.

There are contractors and dealers in the building industry quite as seriously embarrassed as in road building. They have the added difficulty of restrictions imposed on account of the more essential industries taking precedence, causing an almost complete cessation of activities.

As in road building, however, where building operations are carried on in places where barging is available, some construction will continue, especially in view of the fact that there is a supply of reinforcing steel available in smaller sizes capable of production in the smaller mills not affected by the steel preëmption.

Fireproofing Affected Differently

Tile and other fireproofing products coming under a fixed differential are affected in a different manner. The rate is 2c. per 100 lb. or 40c. per ton. The producers have already had their rates increased to 50c. so that the present flat increase of 40c. is really an 80 per cent. increase, whereas the increase in the rates from the Middle West, raised but 40c. per ton on an average of $3.40, is a little less than 12 per cent. This, together with the cheaper cost of production in those districts, will increase the market for these products in the East and cause a heavier demand on the railroads. Those manufacturers argue, however, that a percentage increase based on the high rates they must necessarily pay to reach the Eastern markets, where there is the greatest demand, would be a hardship.

Tile Pipe in St. Louis District

As to effect of increased rates on the sewer-pipe demand, dealers say it will be negligible, with no effect on determining the character of the material handled except in competition with local materials such as concrete. As in the other industries, the sewer-pipe business is more vitally affected by other factors such as Governmental orders from other departments and labor difficulties. It is said there are certain inequalities of charges that will have to be readjusted by the railway administration, as for instance in the St. Louis district the freight increase, together with certain switching charges under the new order, make a haul to East St. Louis cost as much as to Omaha, Neb.

Some municipal work and a few manufacturing plants, it is reported, will discontinue operations slightly earlier in the season, but, other than this, so far as the freight increase is concerned, the situation will not be changed, it is asserted.

Northwest Lumbermen Approve

The regulation regarding lumber, in that the increase of 25% is limited to a maximum of 5c. per 100 lb. will also militate toward longer hauls, but in general the freight rates will cause a negligible increase in the cost of lumber as compared with the prices produced by the heavy demand. The provision, however, of a minimum charge of $15 per car on all carload shipments has caused more or less concern among a number of dealers in the far Northwest.

The $15 provision will have the effect of increasing the cost of transporting logs to some of the mills as much as 100 per cent. Some mills that get their logs over short hauls and on light cars now pay an average of no more than $7.50 per car in freight charges. Under the new order these mills will have to pay $15. Obviously, every mill paying less than $15 per car will be affected.

Generally, however, the lumbermen of the Northwest are of the same opinion as manufacturers in other parts of the country, that the increased revenue will produce the highly desirable betterment of service.

A representative of one of the largest explosive manufacturers in the country also agreed that the increase of freight rates would have a negligible effect on the demand, although, he said, it was too early for his company to state positively what the effect might be. Although their prices are for delivery and not f.o.b., and any freight increase would necessarily affect the price, no price readjustment has so far been made. It would probably not be made until the effect could be studied at the various plants. What increase there would be, he believed, would have no effect on the demand even in normal times.

Steel is, for the present, completely out of the question the United States Government having commandeered the entire output and having regulated it so strictly that dealers who have any stocks on hand are required to produce an affidavit from any consumer to whom they sell that the material will be used exclusively in either United States Government construction or that of the allied governments.

Steel Mills Benefited

The new freight rates will not affect the production and distribution of iron and steel a particle, merely making a slight modification of costs to producers and consumers, say producers. Iron ore is to pay the advance but once, and on its first haul from mine to upper lake port, not from lower lake port to blast furnace; and as iron ore prices are at Lake Erie dock, and from other considerations, it is presumed that the War Industries Board will make a corresponding adjustment in the set price in its adjustment of prices to rule after June 30.

On this assumption the increased cost of assembling raw materials—ore, coke, limestone, etc.—at the blast furnace will be about $1.25 per ton of pig iron, while, including the pig iron, coal, etc., the advance in costs to the steel works will average about $2 per net ton of finished rolled steel. Steel prices are fixed for most products f.o.b. Pittsburgh, whereby the buyer of steel will pay the advance. To a trifling extent some mills will benefit by the advance in finished steel freights; for instance, when a price is based on Pittsburgh, the delivered price is the Pittsburgh price, plus regular freight to destination. If the mill is nearer to the destination than Pittsburgh, the actual freight will be less, and the advance will be less.

The iron and steel trade is therefore paying very little attention to the freight advances, although they would be considered drastic in normal times. The distribution of pig iron and steel products, now taken over more completely by the War Industries Board, and the coming fixing of prices to rule after June 30, are receiving attention to the exclusion of freight rates. There will probably be no advances of moment, except possibly the one in ore; on the other hand there are distinct possibilities of general though not heavy reductions. The producers are making money, it is said, and as the Government is taking so much of the material it would profit in the long run by such reductions.

The consensus of opinion seems to be that this relief to the railroads is none too soon. On account of lack of money, railroad construction and improvement, it is asserted, have been at a standstill for so long a period that today this country and the world at large are suffering inestimable damage from the delay to war operations, as well as to the distress from coal shortage in the domestic supply. Furthermore, say the manufacturers, since those contractors or manufacturers who are supplying direct war needs will be protected against loss by certain revisions, and those industries not contributing directly to the prosecution of the war will, of necessity, have to be curtailed; and since the rates will, through better service, reduce ultimate cost and act more positively in favor of the consumer than an arbitrary reduction, the increased rate will be a stimulus rather than the opposite to general consumption. And finally, according to a prominent engineer in the cement industry, it will produce greater efficiency and tend towards wealth production—a movement that is not only desirable, he stated, but highly necessary to replace the destruction of wealth caused by the war.

New Canadian Shipbuilding Plant to be Erected

A new shipbuilding and repair plant capable of producing ships up to 10,000 tons, the largest hitherto built in Canada, is to be erected at Halifax according to an announcement by the Minister of Marine and Fisheries at Ottawa. It will be operated by a new company known as the Halifax Shipbuilders, Limited.

The drydock at Halifax has been acquired and the damage by the explosion of Dec. 6 will be repaired at once and the plant put in first-class condition. Property adjoining the drydock has also been acquired, and the company states that three shipbuilding berths will be laid down, upon which steel ships of approximately 10,000 tons may be constructed. It is promised that the first ship will be ready for commission inside of 15 months. This plant will add to the already marked expansion of Canadian shipyards.

In 1874, the days of the wooden vessel, Canada produced 190,756 tons of ships. But in 1914 its output had fallen to 43,346 tons, whereas since Mar. 1, 1917, contracts totaling $64,500,000 have been let for construction of ships in Canadian yards. Most of these ships will be for the Imperial Munitions Board, but after these contracts are finished they will continue building under new Government contracts amounting, according to present plans, to from $30,000,000 to $50,000,000 a year. This tonnage will probably come under the jurisdiction of the Minister of Marine and Fisheries, instead of that of the Imperial Munitions Board as heretofore, and will be built exclusively with Canadian capital.

Manufacturers and Publishers Hold Conference

(Concluded from page 1205)

we are cut off by the restriction of export licenses of our Government. He urged that as soon as the ships can be spared from the European routes our export licensing be made more liberal so that we will not lose ground already gained. With proper preparation, he predicted for the United States a great export trade.

F. A. Smythe, president of the Thew Automatic Shovel Co., stated that the Allied Publicity Bureau was established in order to secure for the publicity of the manufacturers represented the same expert service they secure in the various other departments of their business. Publicity, he contended, was a necessary part of every selling campaign.

E. J. Mehren, editor of *Engineering News-Record*, related instances from various fields showing the service rendered by publishers, emphasizing the fact that the Allied Construction Machinery Corporation, from which the idea of the Allied Publicity Bureau originated, was formed as a result of service which S. T. Henry, a publisher at that time, had rendered. The publishers' ability to serve is due to the confidence reposed in them, and that confidence is the fruit of years of disinterested service to the reader. Magazines are good mediums for advertising, he concluded, only because they are made valuable to the reader.

Charles F. Lang, president of the Lakewood Engineering Co., said that the publishers needed more men of a caliber that could be taken into the manufacturer's confidence and be able to assist him with his distribution problem. He hoped the time would come when all advertising would be most carefully edited and standards placed so high that manufacturers would petition for the privilege of advertising.

C. A. Luster, president of the Clyde Iron Works, emphasized the high quality of the products of the manufacturers represented, declaring that therein lay the strength of the Allied Construction Machinery Corporation and the reason for expecting great success from it. W. T. Beatty, president of the Austin Manufacturing Co., protested that the advertising men who came to him were not familiar with his product, its market and its means of distribution, and that he was open to conviction as to advantages of advertising only when the latter was based on careful analysis.

W. H. Taylor, publisher of the *Iron Age*, discussed the condition of the iron and steel trade now, and after the war, closing with a plea that the United States go into Russia and save Russia from itself and at the same time shorten the war. John S. Armour, of the McGraw-Hill Co., spoke briefly and humorously on the human side of business.

Among those present, in addition to the publishers and those mentioned, were H. C. McCardell, secretary and manager of the Parsons Co.; H. O. Davidson, of the Hydraulic Pressed Steel Co.; W. I. Babb, president of the Western Wheeled Scraper Co.; Frank Hase, president of the C. H. & E. Co.; Walter F. Teschan, president of the Milwaukee Concrete Mixer Co.; H. M. Capron, president of the Marsh-Capron Manufacturing Co.; David C. Duncan, general manager of the Carbic Manufacturing Co.; I. R. Smith, president and treasurer of the Sterling Wheel Barrow Co.; W. B. Greene, vice-president of the Barber-Greene Company.

Business Notes

The Westinghouse Electric & Manufacturing Co., Pittsburgh, has announced the purchase of the property and business of the Krantz Manufacturing Co., Inc., Brooklyn, N. Y. The plant will continue the output of safety and semi-safety electrical and other devices, and the supply department of the Westinghouse Co. will act as exclusive sales agent, under the direction of H. G. Hoke of the Westinghouse Company.

The Blaw-Knox Co., manufacturers of Blaw-Knox steel products, Pittsburgh, announce that it has removed its San Francisco office from the Rialto Building to its new office and warehouse at 528-530 Second St. O. B. Pulis is in charge.

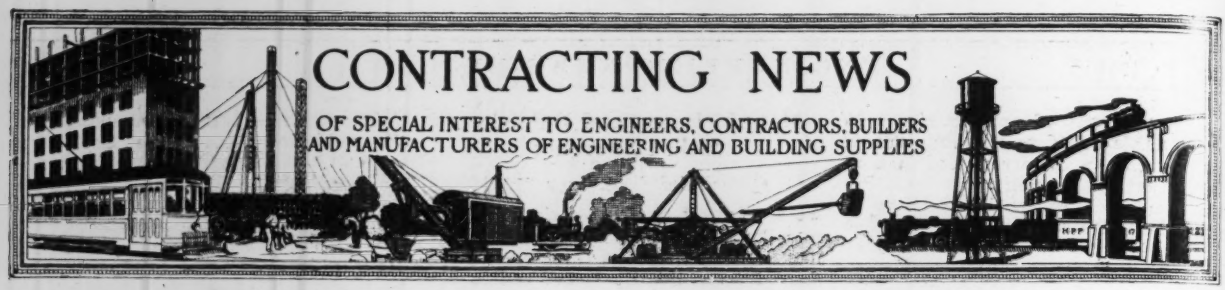
The name of the German-American Portland Cement Works was changed at a meeting of the stockholders to the La Salle Portland Cement Co. The meeting was held in accordance with the statutes of the State of Illinois.

Lyman C. Millard, formerly Baltimore representative of the Southern Pine Sales Corporation, has accepted a commission in the United States Army. He will be succeeded in the Baltimore office by W. E. Pearce.

Trade Publications

"Land Dredges" is the title of Catalog C, received from the Bay City Dredge Works, Bay City, Mich. It is profusely illustrated from photographs of actual work, and contains in addition several assembly diagrams and tables.

The Indiana Air Pump Co. is issuing a catalog of 32 pages entitled "Pumping System for Deep Wells." It covers complete pumping plants for municipal water-works, factories, irrigation plants, country homes, farms, ranches, etc., for one well or any number.


CONTRACTING NEWS
OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS
AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

Proposals

For Proposals Advertised See Pages 58-61 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
June 24	Scobey, Mont.	May 30
June 24	Trommaid, Minn.	June 20
June 25	Watervliet, N. Y. Adv. June 6 and 13.	June 13
June 26	Fayette, Mo.	June 20
June 27	Ossining, N. Y. Adv. June 6 and 13.	June 6
June 27	Winnipeg, Man.	June 20
June 28	Newcastle, Wyo.	June 13
July 3	Ft. Lee, N. Y.	June 20

SEWERS

June 24	Scobey, Mont.	May 30
June 24	Trommaid, Minn.	June 20
June 24	Long Island, N. Y.	June 20
June 26	Junction City, Kan.	June 13
June 27	Passaic, N. J.	June 20
June 27	Ossining, N. Y. Adv. June 6 and 13.	June 6
July 3	Newton, Kan.	June 20
July 10	Bridgeport, Conn. Adv. June 13.	June 13

BRIDGES

June 24	Pensacola, Fla.	June 13
June 24	Nile, Wash.	June 6
June 25	Wrightstown, Wis.	June 20
June 27	Harrisburg, Pa.	June 13
June 27	Chattanooga, Tenn.	June 20
June 28	Niles, Mich.	June 20
June 29	Charleston, W. Va.	June 6
June 29	Newark, O.	June 20
July 1	Santa Barbara, Cal.	June 20
July 9	Worthington, Minn.	June 20
July 31	Santa Domingo Adv. May 16.	May 16

STREETS AND ROADS

June 24	Rockford, Ala.	May 30
June 24	Tennessee Adv. June 6.	June 6
June 24	Minneapolis, Minn.	June 13
June 24	Everett, Wash.	June 13
June 24	California	June 13
June 24	Sheridan, Wyo.	June 20
June 24	Boston, Mass.	June 20
June 25	Ripley, W. Va.	June 6
June 25	Seattle, Wash.	June 13
June 25	Jersey City, N. J.	June 13
June 25	Tennessee Adv. June 6.	June 6
June 25	Wisconsin	June 20
June 25	Jersey City, N. J.	June 20
June 26	Cleveland, O.	June 20
June 26	Junction City, Kan.	June 13
June 26	Illinois	June 20
June 27	McCormick, S. C.	June 13
June 27	New York N. Y.	June 20
June 27	Wisconsin	June 20
June 27	Illinois	June 20
June 27	Cleveland	June 20
June 28	Point Pleasant, W. Va.	June 6
June 28	Topeka, Kan.	June 13
June 28	Ohio.	June 20
June 28	Fayetteville, Ark.	June 20
June 28	Enterprise, Ore.	June 20
June 28	Point Pleasant, W. Va.	June 20
June 28	Illinois	June 20
June 29	Hamilton, O.	June 13
June 29	Madison, Wis.	June 20
June 30	Glendale, Cal.	June 20
June 31	Oswego, Kan.	May 16
July 1	Chicago, Ill.	June 6
July 1	Martinez, Cal.	June 20
July 1	Hamlin, W. Va.	June 20
July 1	English, Ind.	June 20
July 2	Pennsylvania	June 13
July 3	Cleburne, Tex.	June 13
July 3	Rhode Island Adv. June 20.	Jnue 20
July 5	Wilkes Barre, Pa.	June 20
July 8	Liberty, Tex.	June 13
July 8	Chaska, Minn.	June 13
July 9	Sharon, Pa.	June 13
July 9	Sharon	June 6
Aug. 1	Cleveland, O.	Mar. 28

EXCAVATION AND DREDGING

June 26	Shreveport, La.	June 6
June 26	Glenwood, Ia.	June 13
June 27	Dakota City, Ia.	June 13
June 28	Slayton, Minn.	June 13
June 28	Worthington, Minn.	June 13
July 1	Glencoe, Minn.	June 20
July 2	Greenville, Miss.	June 6

INDUSTRIAL WORKS

June 22	Arcade, N. Y.	June 20
June 24	Brooklyn, N. Y.	June 20
June 28	Newark, N. Y. Adv. June 6.	June 6
June 30	Sioux City, Ia.	June 6
July 1	Chicago, Ill.	June 13
July 2	Pompton Lakes, N. J.	June 20
July 3	Oxford, N. Y. Adv. June 20.	June 20

BUILDINGS

June 20	Rutland, Mass.	June 20
June 21	Quincy, Mass.	June 20
June 23	Hawthorne, N. Y.	June 20
June 24	Phoenix, Ariz.	June 13
June 24	Columbus, Mont.	June 20
June 25	Austin, Tex.	June 6
June 25	Wichita Falls, Tex.	June 13
June 25	Columbus, O.	June 20
June 26	Lansing, Mich.	June 6
June 27	Ossining, N. Y. Adv. June 6 and 13.	June 6
June 28	Centralia, Wash.	June 6
June 28	Cobleskill, N. Y. Adv. June 20.	June 20
June 30	Fargo, N. D.	June 13
July 1	Chicago, Ill.	May 23
July 1	Sioux Falls, S. D.	June 13
July 1	Beloit, Wis.	June 20
July 2	Phillips, Neb.	June 20
July 9	Manhattan, Kan.	June 13
July 10	Sioux City, Ia.	June 20
July 15	Phila., Pa.	June 20

FEDERAL GOVERNMENT WORK

June 24	Fire Protection and Water Systems—Spec. 2970—Lake Denmark, N. J.	June 6
June 24	Removing Radio Tower—Spec. 3073—Cordova, Alaska	June 6
June 24	Buildings, Pavement, etc. —Spec. 3044—San Diego, Cal.	June 6
June 24	Emergency Hospital—Spec. 3070—Norfolk, Va.	June 6
June 24	Water Works—Spec. 2970—Great Lakes, Ill.	June 13
June 24	Buildings — Spec. 3078 — Washington, D. C.	June 13
June 24	Power Plant Improvements —Spec. 2967—Washington, D. C.	June 13
June 24	Drill Building—Spec. 3067—Philadelpia, Pa.	June 13
June 24	Exension to Naval Air Station — Spec. 3058 — Rockaway, N. Y.	June 13
June 24	Fitting Out Pier and Slip Spec. 3060—New York, N. Y.	June 13
June 24	Chronometer and Time Station — Spec. 3071—Mare Island, Cal. (Vallejo P. O.)	June 20
June 24	Electric School—Spec. 3064 —Washington, D. C.	June 20
June 24	Radio Block Chimney—Spec. 3097—New York, N. Y.	June 20
June 24	Pump—Newport News, Va.	June 20
June 24	Chemical Laboratory—Spec. 3096—Indian Head—Md.	June 20
June 24	Pier—Spec. 3088 — New York, N. Y.	June 20
June 24	Magazine Building—Spec. 3098—Washington, D. C.	June 20
June 24	Barracks — Spec. 3052 — Portsmouth, N. H.	June 20
June 24	Boiler—Spec. 3102 — New York, N. Y.	June 20
June 24	Barracks — Spec. 3111 — Paris Island, S. C.	June 20
June 25	Grease—Washington, D. C. Adv. June 20.	June 20
June 26	Iron Gates—Denver, Colo.	June 20
June 26	Cottage—Talihina, Okla.	June 20
June 26	Shooting Gallery and Store Room— Spec. 3128 — Norfolk, Va.	June 20
June 28	Willows and Poles—New Orleans, La. Adv. June 6.	June 6
June 28	Stone—New Orleans, La. Adv. June 6.	June 6
June 28	Beam Hangers—Washington, D. C.	June 20
June 29	Dredging—San Juan, P. R. Adv. June 6.	June 6
June 30	Building—Savannah, Ga.	May 23
July 1	Recess and Machinery — Wheeling, W. Va.	June 13
July 1	Sprinkler System — Spec. 3068—Mare Island (Vallejo P. O.) Cal.	June 13
July 1	Fitting Out Pier and Slip-Spec. 3060—New York, N. Y.	June 20
July 1	Storehouses and Magazines —Spec. 2990 — Hingham, Mass.	June 20
July 1	Extension to 2nd Locomotive House—Lake Denmark, N. J.	June 20
July 1	Hangar — Beach, Pier — Spec. 3112—Key West, Fla.	June 20
July 1	Heating Mains—Spec. 3094 —Norfolk, Va.	June 20
July 1	Annex Buildings, Etc.—Spec. 3063—Philadelphia, Pa.	June 20
July 1	Boiler—Spec. 3121—New London, Conn.	June 20
July 1	Underground Heating Mains—Spec. 3094—Norfolk, Va.	June 20
July 1	Emergency Hospital—Spec. 3070—Norfolk, Va.	June 20
July 1	Landing Beach—Spec. 3031 —Washington, D. C.	June 20
July 1	Seaman Guard Unit—Spec. 3082—Great Lakes, Ill.	June 20
July 1	Canal Wall—Washington D. C.	June 20
July 3	Levee Work—St. Louis, Mo. Adv. June 6.	June 6
July 5	School—Ft. Yates, N. D.	June 6
July 5	Dredging and Rock Removal—New York, N. Y.	June 13
July 22	4 Radio Buildings—Spec. 3069—Haiti	June 20

MISCELLANEOUS

July 6	Flood Control Work—Dayton, O.	June 20